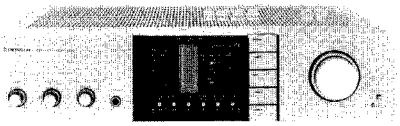
PIONEER®

Service Manual

CIRCUIT DESCRIPTIONS



ORDER NO.
ART-762-0

NON SWITCHING AMP
STEREO AMPLIFIER

A-6
A-5

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CIRCUIT DESCRIPTIONS

The Model A-5 and A-6 are integrated amplifiers belonging to the same series. The table shown below lists and compares the major circuits and performance characteristics of both models. The general circuit configuration for Model A-6 is shown by block diagram in Fig. 1; Fig. 2 shows Model A-5. The circuit description will be based on Model A-6.

Circuit-Performance Comparison

Circuit	Model A-6	Model A-5
Equalizer Amp	• Amplifier section uses a dual FET differential input amp and operational amp IC. OCL and ICL configuration obtained by using DC servo-control circuit. MM and MC cartridge compatibility.	• Uses operational amp IC. MM cartridge only.
	• Hum and Noise (IHF, short circuited A network) PHONO MM . . . . . 86dB PHONO MC . . . . . 70dB • Overload Level (T.H.D. 0.002%, 1kHz) PHONO MM . . . . . 150mV PHONO MC . . . . . 15mV • Frequency Response (RIAA Equalization) . . . . . 20Hz – 20kHz ±0.2dB	• Hum and Noise (IHF, short circuited A network) PHONO MM . . . . . 70dB • Overload Level (T.H.D. 0.004%, 1kHz) PHONO MM . . . . . 140mV • Frequency Response (RIAA Equalization) . . . . . 20Hz – 20kHz ±0.5dB
Power Amp	• Non-switching Amp using high speed bias servo-control circuit in power stage. OCL and ICL configuration obtained by using dual FET differential input amp and DC servo-control circuit.	• Non-switching type power amp using high speed bias servo-control circuit in power stage.
	• Continuous Power Output (both channel driven) 20Hz – 20 kHz . . . . . 60W+60W (T.H.D. 0.008%) • Total Harmonic Distortion (20Hz – 20kHz, 8Ω, from AUX) Continuous rated power output . . . . . No more than 0.008% 30W per channel power output . . . . . No more than 0.006% • Frequency Response . . . . . 5Hz – 100kHz $^{+0}_{-3}$ dB	• Continuous Power Output (both channel driven) 20Hz – 20kHz . . . . . 35W+35W (T.H.D. 0.009%) • Total Harmonic Distortion (20Hz – 20kHz, 8Ω, from AUX) Continuous rated power output . . . . . No more than 0.009% 17.5W per channel power output . . . . . No more than 0.007% • Frequency Response . . . . . 5Hz – 100kHz $^{+0}_{-3}$ dB
Tone Control Circuit	• Constructed within the NFB circuit of power amp. Tone switch tunrs circuit ON/OFF.	• Same as Model A-6
Protection Circuit	• Senses DC voltage and overload in output of power amp, activating relay to disconnect speaker system from power amp output. Also functions as transient killing muting circuit when power switch turned ON/OFF.	• Same as Model A-6
Power Meter Circuit	• IC (TA7318P) functions to compress and rectify power amp output signal, and drives 7-point LED meter module. Signal peak value displayed.	• Not featured in Model A-5

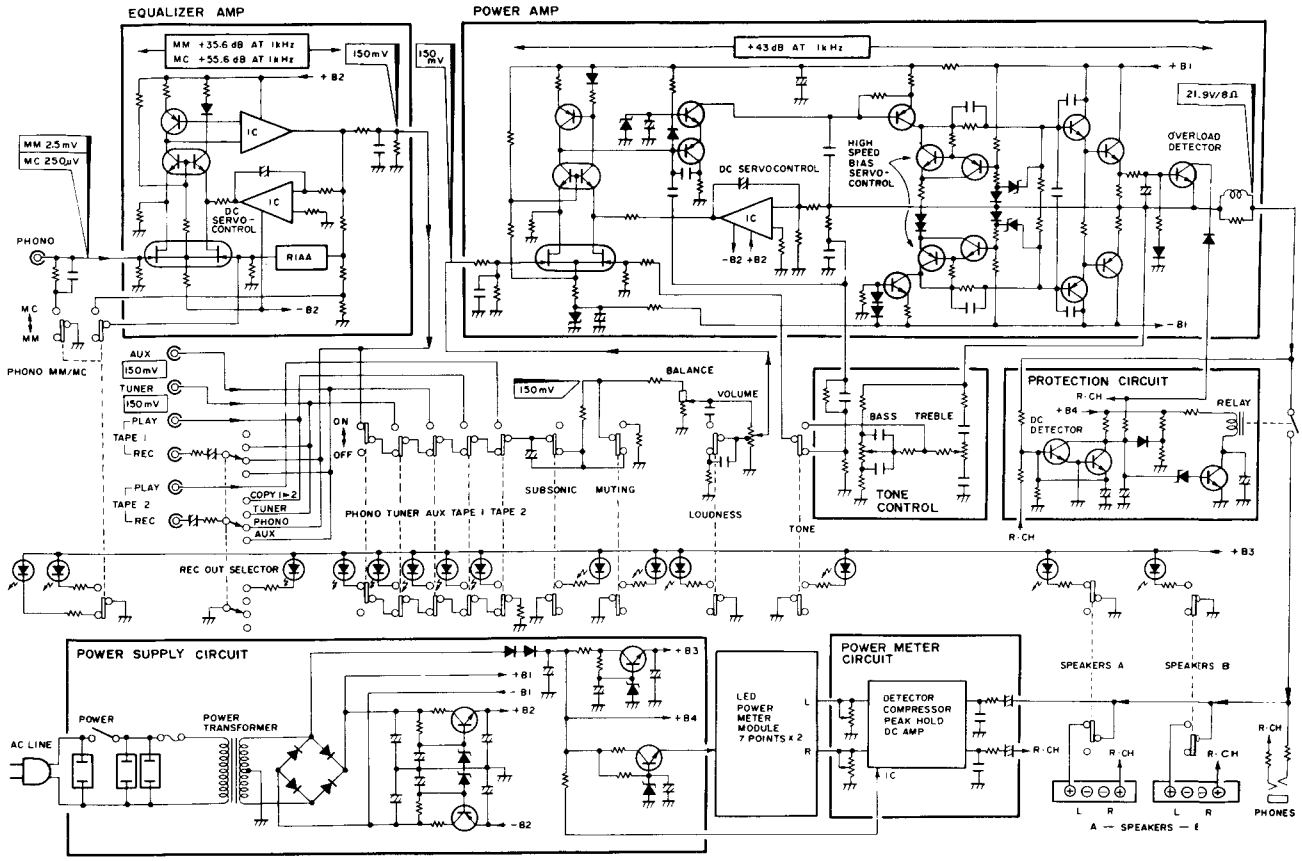

Fig. 1 Block diagram of Model A-6

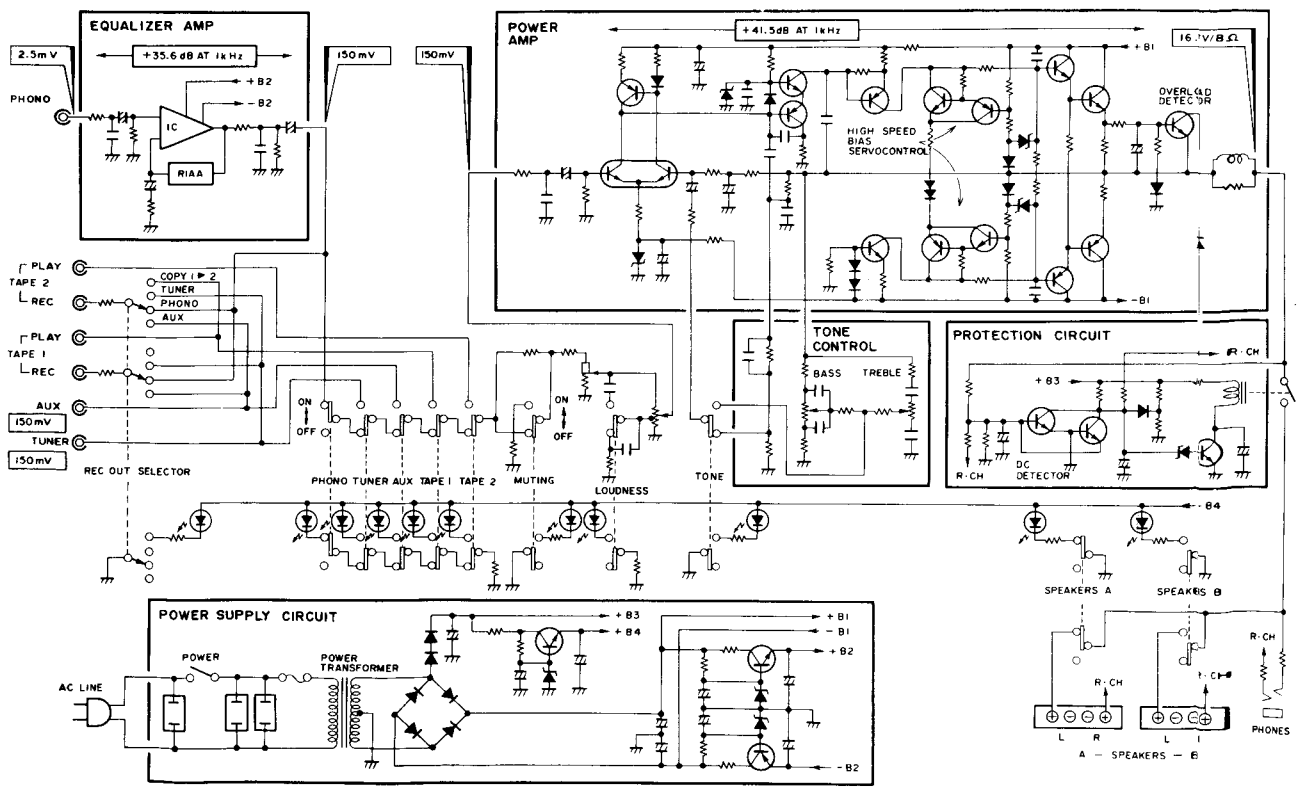

Fig. 2 Block diagram of Model A-5

Equalizer Amplifier

The equalizer amp is input and output capacitorless (ICL, OCL) and has a built-in DC servo-control circuit. The basic circuit for Model A-6 is shown in Fig. 3.

The first stage uses a cascade connected dual FET (Q7) and NPN dual transistor (Q5), and current mirror loading is provided by the current mirror circuit consisting of a PNP transistor (Q3) and diode (D1). The cascade connection lowers the load impedance of the FET (Q7). The mirror effect reduces the degradation of high frequency response, and at the same time, suppresses the voltage level between the drain and source of the FET, resulting in lower noise due to gate leak current. The current mirror circuit assures high gain and also serves to cancel even harmonic related distortion.

The voltage amplification stage and output stage consists of an operational amplifier IC (NJM4558DX).

To allow the use of both MM and MC cartridges, a selector switch is provided in both the input circuit of the equalizer amp and the NFB circuit. This selector switch chooses an input impedance of 50kΩ and a gain of 35.6dB for MM cartridges, and an input impedance of 100Ω with a gain of 55.6dB for MC cartridges.

The DC servo-control circuit (Q1, IC2/2) serves to detect DC components in the equalizer amp output (using an integrating circuit), and the results are used for feedback to the emitter of Q5. This controls the DC input voltage of IC1/2, and the DC level of output is constantly held to 0V.

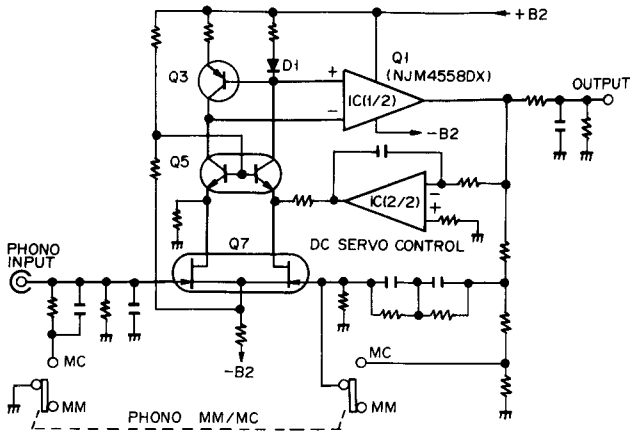

Fig. 3 Equalizer amplifier

Power Amplifier

The power amplifier achieves its Non Switching characteristics by using a high speed bias servo-control circuit within the power stage bias circuit. Additionally, the use of a DC servo-control circuit and FET differential input amp give it an ICL-OCL configuration.

The first stage is a cascode bootstrap differential amp consisting of a dual FET (Q425) and NPN dual transistor (Q401), and a current-mirror loading circuit is provided. The second stage consists of a cascaded PNP transistor (Q405) and NPN transistor (Q407) resulting in improved high frequency response. The power stage uses a 2-stage Darlington connection with a high speed bias servo-control circuit within the bias circuit (for details, refer to the section on the High Speed Bias Servo-Control Circuit). Additionally, differen-

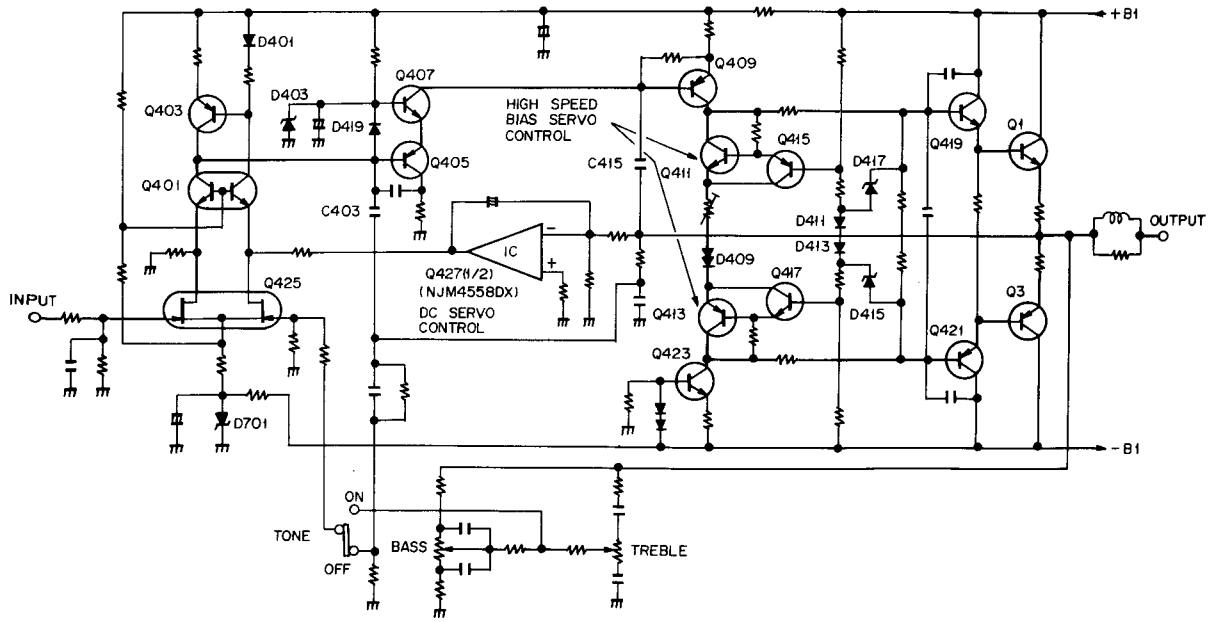

Fig. 4 Power amplifier

tial NFB (C403, C415) is applied to each amplification stage using the Nested Feedback Loops (NFL) [for details, refer to the section on "Nested Feedback Loops (NFL)"].

- **Nested Feedback Loops (NFL)** *

Generally, NFB amplifiers function by amplifying the differential signal obtained at the input circuit when the feedback signal "βVo" (β = feedback ratio) is subtracted from the input signal "Vi" (Fig. 5). This results in amplification stability, better frequency response, improved non-linear distortion factors and S/N ratios, and serves to control the input and output impedance. However, when Vi and Vo are 180° out of phase, the differential signal becomes Vi + βVo; this being referred to as PFB (Positive Feedback). And when $\beta \cdot A1 \cdot A2 \cdot A3 \geqq 1$, the amplitude of the amplifier output (Vo) is increased until vibration finally results. In order to avoid such occurrences and to provide a stable amp configuration, NFB is used with the phase difference between Vi and Vo maintained constantly less than 90°. In order to hold the phase difference within 90°, it is necessary to attenuate high frequency response by -20dB/decade** when the circuit is open loop (voltage feedback loop disconnected). This is shown in Fig. 6. In most amplifiers, this high frequency attenuation is accomplished by band limiting using a phase compensation circuit. Hower, this method results in less and less NFB as frequency increases, loosing much of the effectiveness of NFB.

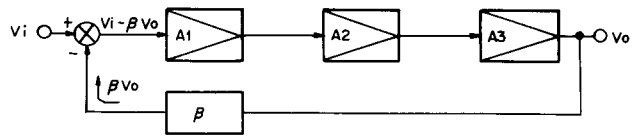

Fig. 5 Previous NFB amp

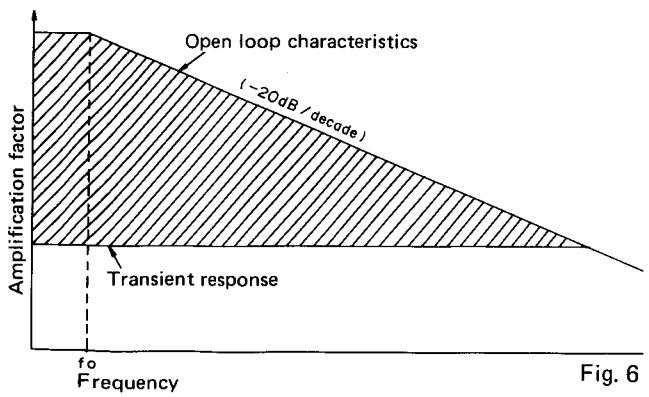

Fig. 6

* *This technology initated by Associate Professor Edward M. Cherry of Monash University, Australia.*

** *-20dB/decade: Slope characteristics resulting from 1/10th amplification factor for every 10 power increase in frequency.*

The Nested Feedback Loops (NFL) was developed based on a need to overcome the problem with NFB techniques as noted above, and based on the fact that the output stage of amplifiers are generally distortion producers. Thus, differential NFB is taken from the output stage in multiple loops. Figure 7 shows a block diagram of the Nested Feedback Loops (NFL).

Figure 8 shows a characteristics diagram. The line marked by ⓐ shows the circuit's open loop characteristics, and ⓑ shows the characteristics after differential NFB (C415) has been applied. ⓒ shows the characteristics after differential NFB (C403) has been applied to ⓑ . This line is also where open loop characteristics are in previous circuit. Transient response is obtained by applying NFB β to ⓒ as in previous circuit. As may be noted in Fig. 8, the amount of NFB present at high frequencies (differential NFB C415, C403) is much greater than in previous circuit, but only the amount of NFB is increased.

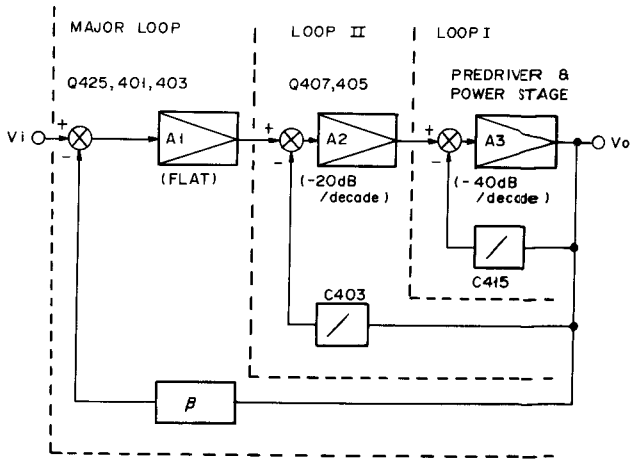

Fig. 7 Block diagram of NFL

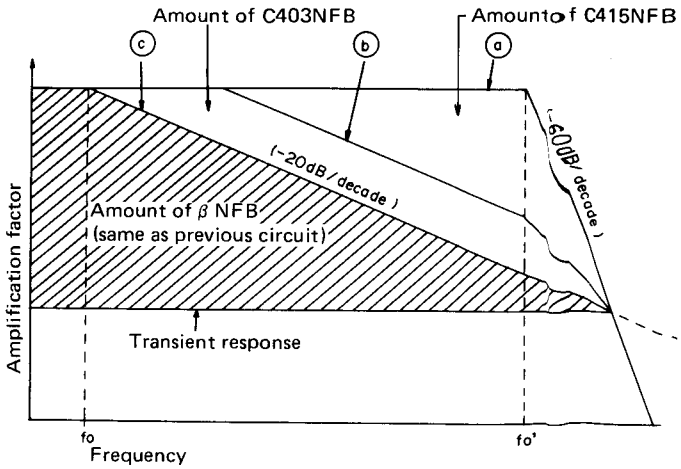

Fig. 8

As for stability, compared with the -40dB/decade applied to the open loop characteristics of the A3 amp, -20dB/decade of extra differential NFB (C415) is used for a relative difference of 20dB/decade, and this serves to maintain the stability of Loop I. Next, when the A2 amp is included in the overall circuit, with its designed high frequency response of -20dB/decade added to the -20dB/decade high frequency response of Loop I, the high frequency slope becomes -40dB/decade. To this is applied -20dB/decade of differential NFB, so the stability of Loop II is also maintained. And since A1 is a flat amp, the high frequency response of A1, Loop I, and Loop II becomes -20dB/decade (Ⓒ in Fig. 8), and NFB (β) applied to this results in superior overall stability.

- High Speed Bias Servocontrol Circuit

By operating the power stage only within the active region (no possible cut-off) and with minimum idle current, the high speed bias servocontrol circuit prevents the generation of switching distortion and reduces heat loss.

This circuit is outlined in Fig. 9. When there is no signal applied to the circuit, Q1 and Q2 are almost cut off, while Q3 and Q4 will be on. The voltage across the collector and base of both of these transistors (Q3 and Q4) at this time may be disregarded. Consequently, with the power stage bias circuit consisting of 4 PN junctions formed by Q3, D3 and Q4, and VR1.

With R1 and D1 ensuring a constant flow of current, the base of Q1 and point X may be brought to the same level on an AC basis (level fluctuations due to the signal) by a simple shift in DC level. Furthermore, Q1 may be considered emitter-follower with R3 as the emitter resistance.

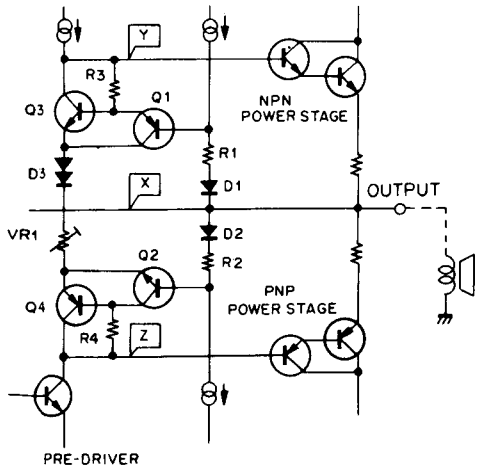

Fig. 9 Basic circuitry of High speed bias servocontrol circuit

When the voltage across points Y and X is increased by the positive portion of the signal applied to this circuit, it becomes the input signal of this emitter-follower (Q1). Since the emitter-follower voltage gain is practically 1, a voltage more or less equal to that of the input signal (that is, the voltage increase across points Y and X) is produced at R3. And the R3 voltage is the voltage applied across the base and collector of Q3 which forms part of the power stage bias circuit. So the bias voltage applied to Q3 will be in excess by the same amount the voltage across points Y and X is increased (by positive portion of the signal) above the voltage level when no signal is being applied. Consequently, the increase in voltage across points Y and X cancels the decrease in voltage across points X and Z, thereby maintaining the idle current without cutting the PNP power stage off (noting that there actually is a slight decrease in current). For the negative portions of the signal, Q2 and Q4 are operated in the same manner, thereby preventing the NPN power stage form being cut off.

Peak Power Indicator Circuit

The A-6 indicates power output from 0.01 watt to 100 watts peak power using a 7 point LED display without range switching. The power amplifier output signal is passed through a low-pass filter, then input to IC (TA7318P-A). This IC consists of a detector circuit, compressor (40dB), and peak-hold circuit for each channel. The signal, after being processed by this IC, is input to the LED power meter module containing the voltage comparators and LED drivers. Here, the LEDs are driven (illuminated) in accordance with the input level.

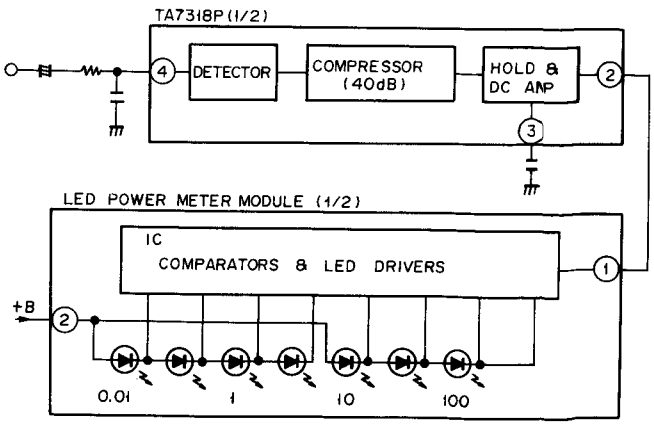

Fig. 10 Peak power indicator ciruit

Protection Circuit

The purpose of this circuit is to protect both the speakers and the power amplifiers. The relay in the output circuit is automatically opened in any of the following cases:

1. During the "transient operations" when the power supply is turned on and off.
2. Upon detection of a DC voltage in the output circuit, caused by component failure or accident.
3. Upon detection of an overload, caused by a short circuit in the load.

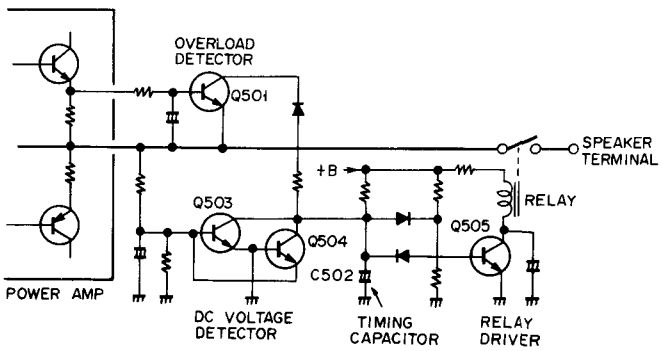

Fig. 11 Protection circuit

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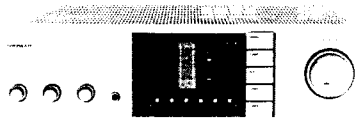
Service Manual

REPAIR & ADJUSTMENTS



ORDER NO.
ART-617-0

NON SWITCHING AMP
STEREO AMPLIFIER

A-6

MODEL A-6 COMES IN SIX VERSIONS DESTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
KU	120V only	U.S.A. model
S	110V, 120V, 220V and 240V (Switchable)	General export model
KC	120V only	Canada model
YP	240V only	Australia model
HE	220V and 240V (Switchable)	Europe model
HB	220V and 240V (Switchable)	United Kingdom model

- This service manual is applicable to the KU type. When repairing the HE, HB types, please see the additional service manual (ART-618), and see the ART-619 for S, YP and KC types.
- For the circuit description, please refer to the supplement of model A-6 service manual (ART-762).
- Ce manuel d'instruction se refère au mode de réglage, en français.
- Este manual de servicio trata del método de ajuste escrito en español.

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1. SPECIFICATIONS

Amplifier Section

Continuous Power Output is 60 watts* per channel, min., at 8 ohms from 20 Hertz to 20,000 Hertz with no more than 0.008% total harmonic distortion.

Total Harmonic Distortion (20 Hertz to 20,000 Hertz, 8 ohms, from AUX)
- continuous rated power output ..... No more than 0.008%
- 30 watts per channel power output .. No more than 0.006%

Intermodulation Distortion (50 Hertz:7,000 Hertz = 4:1, 8 ohms, from AUX)
- continuous rated power output ..... No more than 0.006%
- 30 watts per channel power output .. No more than 0.004%

Damping Factor (20 Hertz to 20,000 Hertz, 8 ohms) 60

Input Sensitivity/Impedance
- PHONO MM ..... 2.5 mV/50 kilohms
- PHONO MC ..... 0.25 mV/100 ohms
- TUNER, AUX, TAPE PLAY 1, 2 ..... 150 mV/50 kilohms

Phono Overload Level (T.H.D. 0.002%, 1,000 Hz)
- PHONO MM ..... 150 mV
- PHONO MC ..... 15 mV

Output (Level/Impedance)
- TAPE REC 1, 2 ..... 150 mV/2.7 kilohms
- Speaker ..... A/OFF, B/OFF (6~16 Ω)

Frequency Response
- PHONO MM (RIAA Equalization) ..... 20 Hz to 20,000 Hz±0.2 dB
- TUNER, AUX, TAPE PLAY 1, 2 ..... 5 Hz to 100,000 Hz $^{+0}_{-3}$ dB

Tone Control
- BASS ..... ±8 dB (100 Hz)
- TREBLE ..... ±8 dB (10 kHz)

Filter
- LOW (SUBSONIC) ..... 15 Hz (6 dB/oct.)

Loudness Contour (Volume control set at −40 dB) ..... +6 dB (100 Hz), +3 dB (10 kHz)

Hum and Noise (IHF, short-circuited A network)
- PHONO MM ..... 86 dB
- PHONO MC ..... 70 dB
- TUNER, AUX, TAPE PLAY 1, 2 ..... 100 dB

Muting ..... −20 dB

Miscellaneous

Power Requirements ..... 120 V, 60 Hz
Power Consumption ..... 280 Watts (UL) 350 VA (CSA)
Dimensions ..... 420 (W) x 98 (H) x 367 (D) mm
16-9/16 (W) x 3-7/8 (H) x 14-11/16 (D) in
Weight (without package) ..... 7.0 kg (15 lb 7 oz)

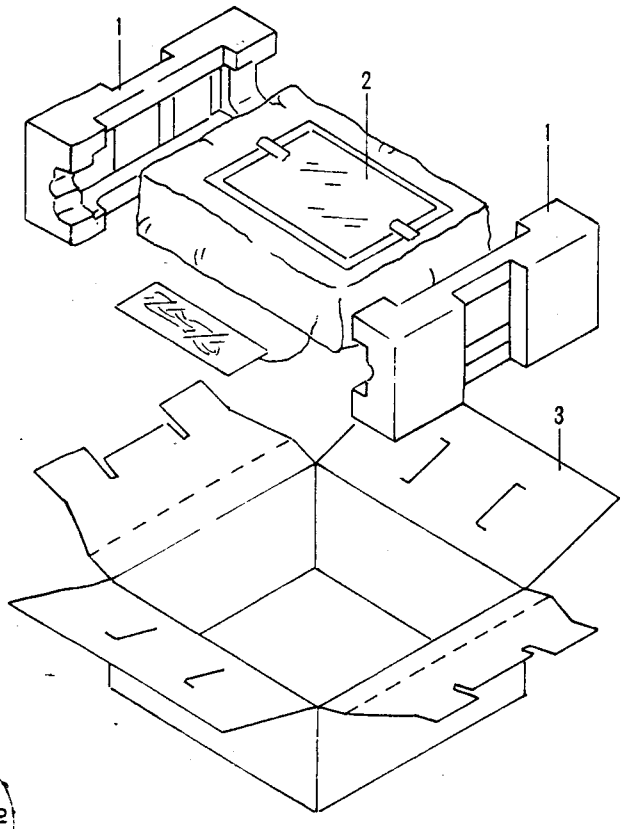
Furnished Parts

Operating Instructions 1

**Measured pursuant to the Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifier.*

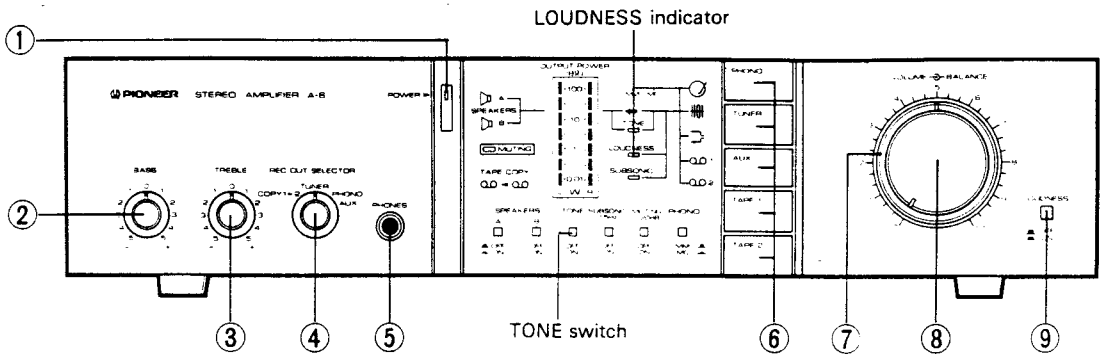
NOTE:
Specifications and design subject to possible modification without notice.

2. PACKING



Mark	No.	Part No.	Description
	1.	AHA-292	Side pad
	2.	ARB-415	Operating instructions (English)
	3.	AHD-921	Packing case

3. FRONT PANEL FACILITIES



① POWER SWITCH

Power is supplied to the stereo amplifier as soon as this switch is depressed to the ON position.
The power is turned off when the switch is released to the OFF position.

② BASS CONTROL

This is used to adjust the bass (low-frequency range) sound. Rotate this control with the TONE switch depressed to the ON position. The bass is emphasized when the control is rotated clockwise from its center position and attenuated when it is rotated counterclockwise.

③ TREBLE CONTROL

This is used to adjust the treble (high-frequency range) sound. Rotate this control with the TONE switch depressed to the ON position. The treble is emphasized when the control is rotated clockwise from its center position and attenuated when it is rotated counterclockwise.

④ REC OUT SELECTOR SWITCH

This is used to select the output signal which is fed out to the TAPE REC 1, 2 jacks.

COPY 1 ▶ 2: The output signal is fed out from the TAPE 1 PLAY jacks to the TAPE 2 REC jacks (when dubbing a tape from TAPE 1 to TAPE 2).

TUNER: The output signal from the TUNER jacks is fed out to the TAPE 1 REC and TAPE 2 REC jacks.

PHONO: The output signal from the PHONO jacks is fed out to the TAPE 1 REC and TAPE 2 REC jacks.

AUX: The output signal from the AUX jacks is fed out to the TAPE 1 REC and TAPE 2 REC jacks.

⑤ PHONES JACK

Connect the plug on your headphones to this jack when listening to a program in private.

> To listen to a program through the headphones, release both the SPEAKERS A and B switches to the OFF positions.

⑥ FUNCTION SWITCHES

These are used to select the sound source. At the left of each switch there is a function indicator (pictographic) which lights when the corresponding switch has been depressed. This indicates that the lighted function has been selected.

PHONO: Depress for playing records on a turntable connected to the PHONO jacks.

TUNER: Depress for listening to a program on a tuner connected to the TUNER jacks.

AUX: Depress for listening to the sound from a stereo component connected to the AUX jacks.

TAPE 1: Depress for listening to a tape in a tape deck connected to the TAPE 1 jacks or to monitor a recording.

TAPE 2: Depress for listening to a tape in a second tape deck (or other adaptor component) connected to the TAPE 2 jacks or to monitor a recording.

NOTE:
Depress only one function switch at a time. The desired program source may not be selected if two or more switches are depressed at the same time.

⑦ BALANCE CONTROL

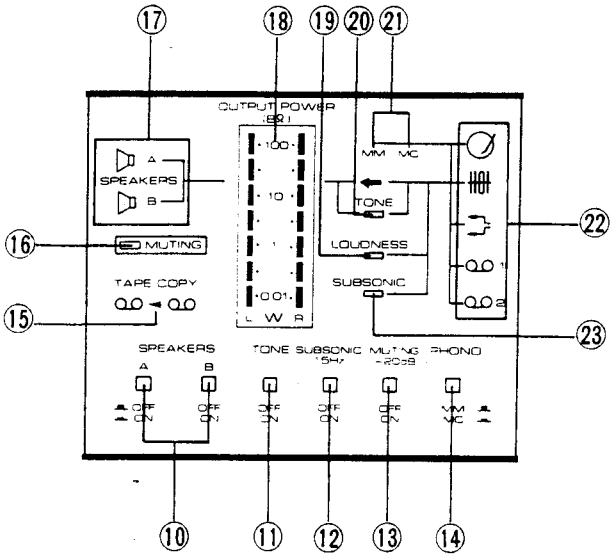
This is used to adjust the balance of the sound from the left and right channels. When rotated clockwise from its center position, the volume of the left (L) channel is reduced; when rotated counterclockwise, the volume of the right (R) channel is reduced.

⑧ VOLUME CONTROL

This is used to adjust the volume of sound heard through the speakers or headphones. No sound is heard when it is set to the "0" position. To increase the volume, rotate this control slowly clockwise (↻).

⑨ LOUDNESS SWITCH

The bass and treble sound is emphasized when this switch is depressed to the ON position (LOUDNESS indicator lights) under low volume listening conditions. The sound comes alive even when the volume is low.



⑩ SPEAKERS SWITCHES

These are used to select the speakers through which you will listen to the sound. When one of the switches is depressed, the corresponding speaker indicator will light to indicate that the selected speakers are now working.

A: The sound is heard from the speakers connected to the speaker A terminals.

B: The sound is heard from the speakers connected to the speaker B terminals.

No sound will be heard when SPEAKERS A and B switches are both released. This is the position at which the sound can be heard through the headphones.

⑪ TONE SWITCH

When this switch is depressed to the ON position (TONE indicator lights), the input signal's tone quality can be adjusted with the tone controls.

⑫ SUBSONIC FILTER SWITCH

The subsonic filter with the 15 Hz cutoff frequency is actuated when this switch is depressed to the ON position (the SUBSONIC indicator lights).

This filter serves to attenuate frequencies lower than 15 Hz with a 6 dB/oct slope and, therefore, it can be used to suppress the ultra-low-range noise which is generated by record warp and other factors. This noise cannot actually be heard by the ear but it can cause cross modulation distortion and even speaker damage. Use this switch when required during record play.

⑬ MUTING −20 dB SWITCH

The volume is attenuated by −20 dB when this switch is depressed to the ON position (MUTING indicator lights). The switch can be used effectively when the stylus descends onto the record during record play, when the sound is to be turned down temporarily and when you want to adjust the sound precisely as you listen to a program source under low sound level conditions.

⑭ PHONO MM/MC SELECTOR SWITCH

Set this switch to the position corresponding to the cartridge used when playing records on a turntable connected to the PHONO jacks.

MM : Set here when using an MM cartridge.

MC : Set here when using an MC cartridge.

⑮ TAPE COPY INDICATOR

This indicates the tape deck which is recording in accordance with the position selected by the REC OUT SELECTOR switch.

⑯ MUTING INDICATOR

This lights up red in accordance with the ON position of the MUTING switch.

⑰ SPEAKERS A/B INDICATORS

These light when one of the SPEAKERS switches has been depressed.

⑱ OUTPUT POWER 8 Ω INDICATORS

These indicate the output level when speakers with an 8-ohm impedance are connected to the speaker terminals. L is for the left channel and R for the right channel.

⑲ LOUDNESS INDICATOR

This lights when the LOUDNESS switch has been set to ON.

⑳ TONE INDICATOR

This lights when the tone control circuitry has been actuated.

㉑ MM/MC INDICATORS

These light in line with the selected position of the PHONO MM/MC selector switch.

MM: Yellow green display

MC: Orange display

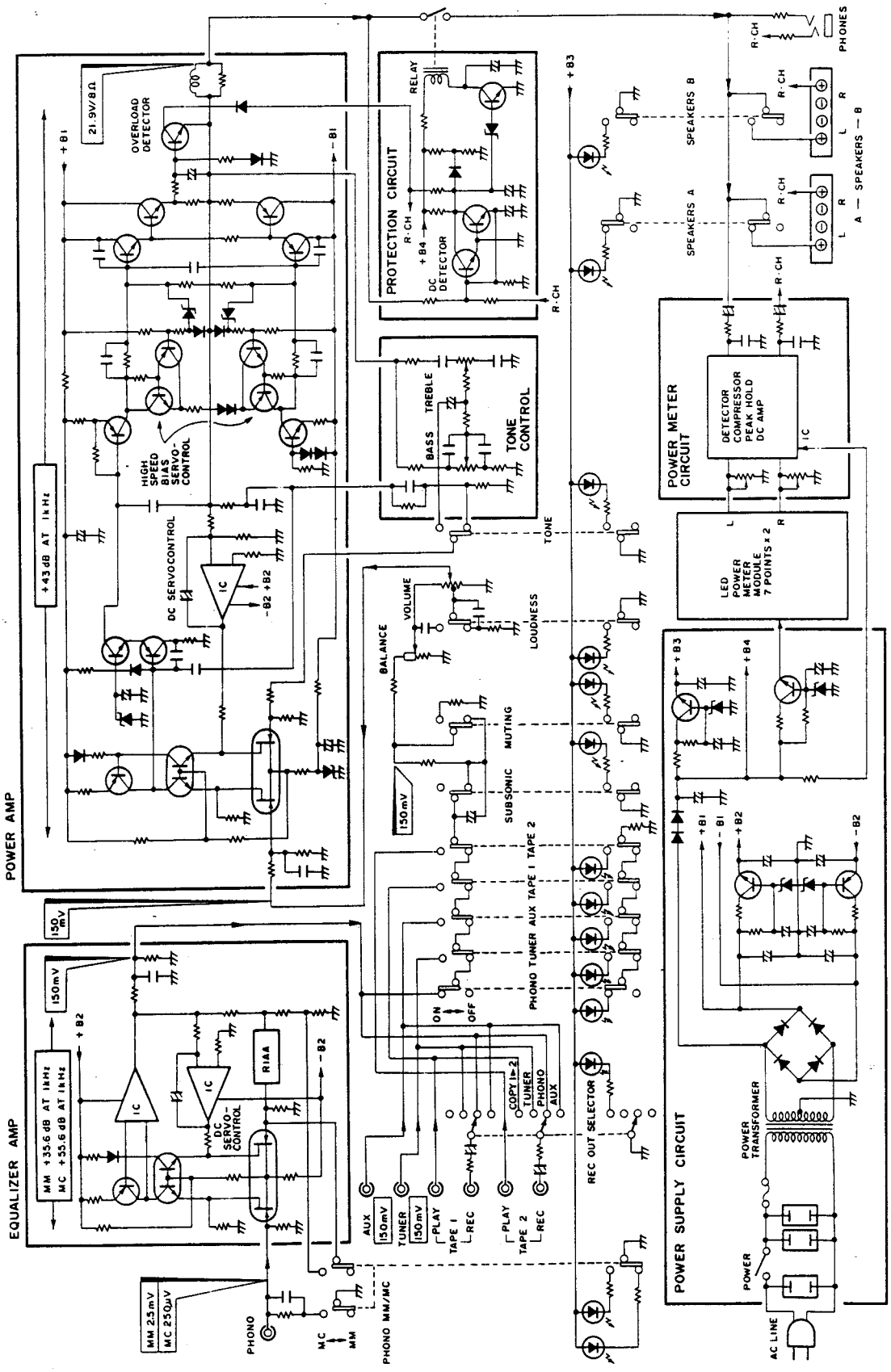
㉒ FUNCTION INDICATORS

The indicator corresponding to the selected function switch lights.

㉓ SUBSONIC INDICATOR

This lights when the SUBSONIC filter switch has been set to ON.

4. BLOCK DIAGRAM

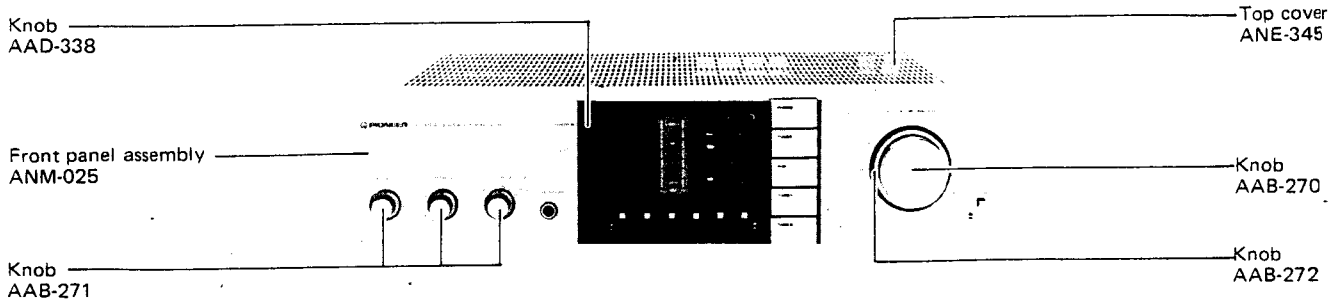


5. PARTS LOCATION

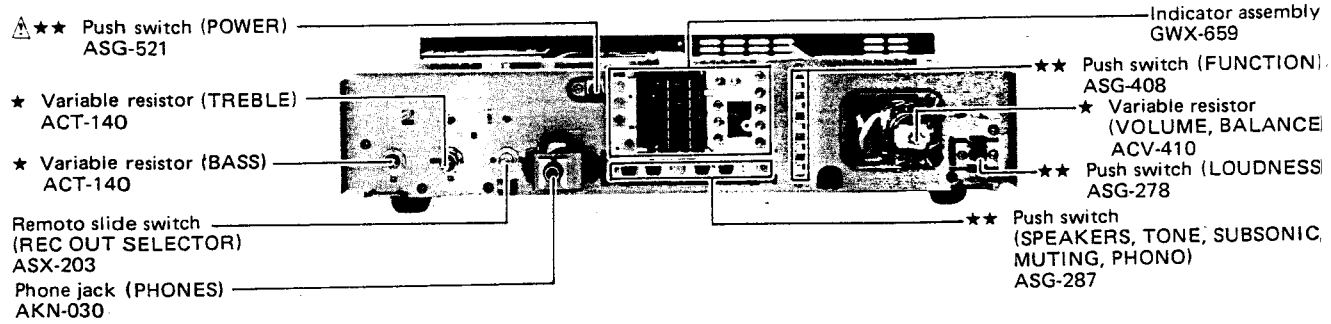
NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ *GENERALLY MOVES FASTER THAN* ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

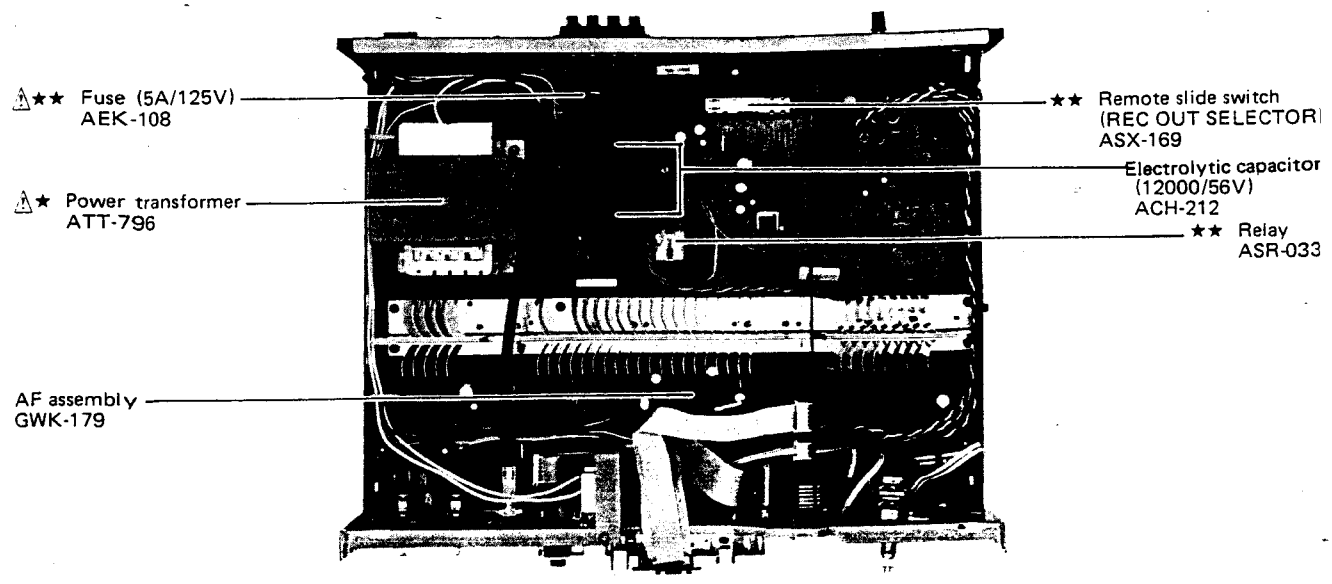
Front Panel View



Front View with Panel Removed



Top View



6. EXPLODED VIEWS

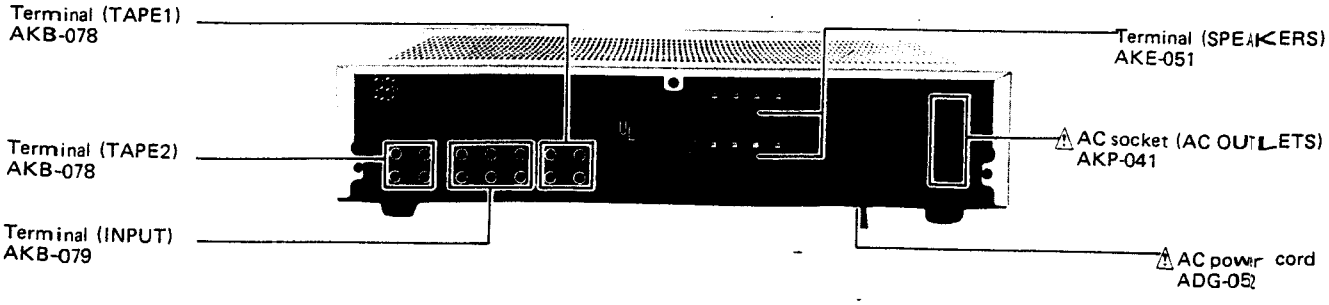
Parts List of Exterior Components

Mark	No.	Part No.	Description
	1.	ANE-345	Top cover
	2.	VBZ30P060FMC	Screw 3x6
	3.	ANM-025	Front panel assembly
	4.	AAB-271	Knob (BASS, TREBLE, REC OUT SELECTOR)
	5.	AAB-270	Knob (VOLUME)
	6.	AAB-272	Knob (BALANCE)
	7.	NKX1FUC	Nut
	8.	WAX1F160U050	Washer
	9.	BBT30P080FZK	Screw 3x8
	101.		Lug
	102.		Bottom plate

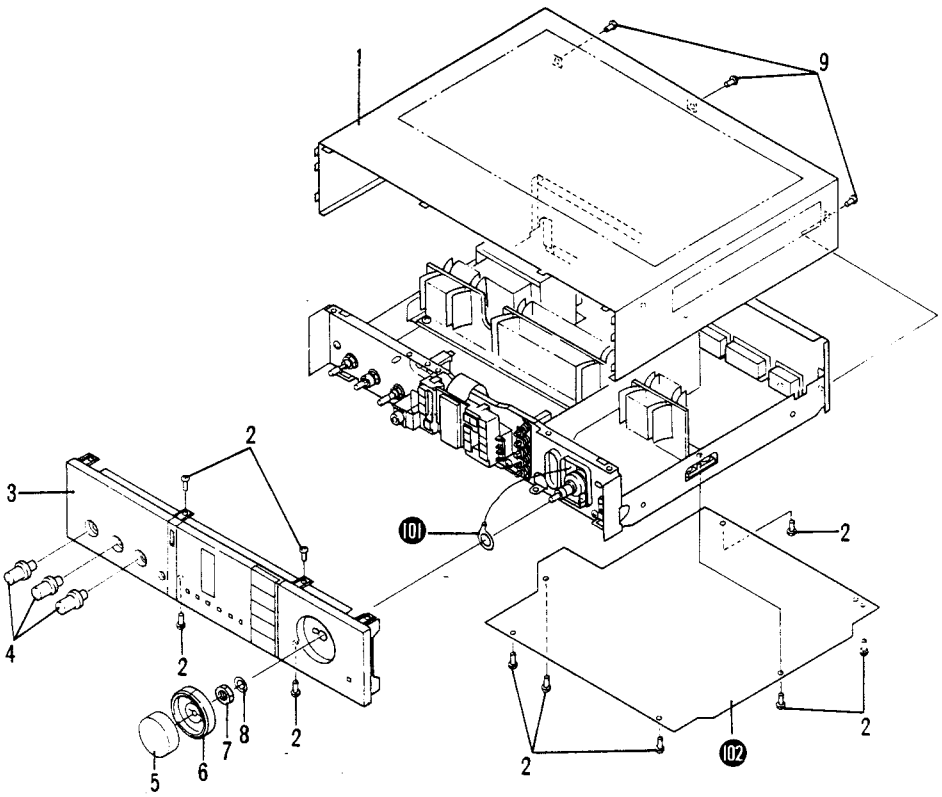
Parts List of Interior Components

Mark	No.	Part No.	Description
⚠ ★	1.	ATT-796	Power transformer
	2.	VXZ40P080FMC	Screw 4x8
	3.	AEC-383	Foot assembly
	4.	AAD-338	Knob (POWER)
	5.	VBZ30P060FMC	Screw 3x6
	6.	ABN-024	Washer faced nut
	7.	ABN-028	Nut
	8.	ABA-261	Screw 3x6
	9.	GWX-659	Indicator assembly
	10.	ASX-203	Remote slide switch (REC OUT SELECTOR)
⚠ ★★	11.	ASG-521	Push switch (POWER)
	12.	VBZ30P080FMC	Screw 3x8
	13.	AEC-488	Insulator spacer
★★	14.	2SC2525/A/-G* (2SC2525/A/-X*)	Transistor
★★	15.	2SA1075/A/-G*) (2SA1075/A/-X*)	Transistor
		*hfe should have the same value.	
	16.	ABA-258	Screw 3x16
⚠ ★★	17.	AEK-108	Fuse (5A/125V)
	18.	GWK-179	AF assembly
⚠	19.	ACG-019	Ceramic capacitor (0.01/150V)
	20.	AEC-510	Nylon rivet
	21.	ABA-252	Screw 3x8
⚠	22.	AKP-041	AC socket (AC OUTLETS)
	23.	BBT30P080FZK	Screw 3x8
	24.	MTZ30P100FZK	Screw 3x10
	25.	AEC-327	Strain relief
⚠	26.	ADG-052	AC power cord
	27.	AKE-051	Terminal (SPEAKERS)
	28.	WA35F100N080 AWX-212	Washer Composition assembly (Function switch ass'y + Tone control ass'y)
	101.		Frame
	102.		Flexible joint
	103.		Panel stay
	104.		Mounting plate
	105.		Holder
	106.		Tone control assembly
	107.		Shielding case
	108.		Wire clip
	109.		Headphones jack assembly
	110.		Function switch assembly
	111.		Volume assembly
	112.		Loudness assembly
	113.		P.C. Board spacer
	114.		Right frame
	115.		Heat sink
	116.		Rear panel
	117.		Terminal (GND)

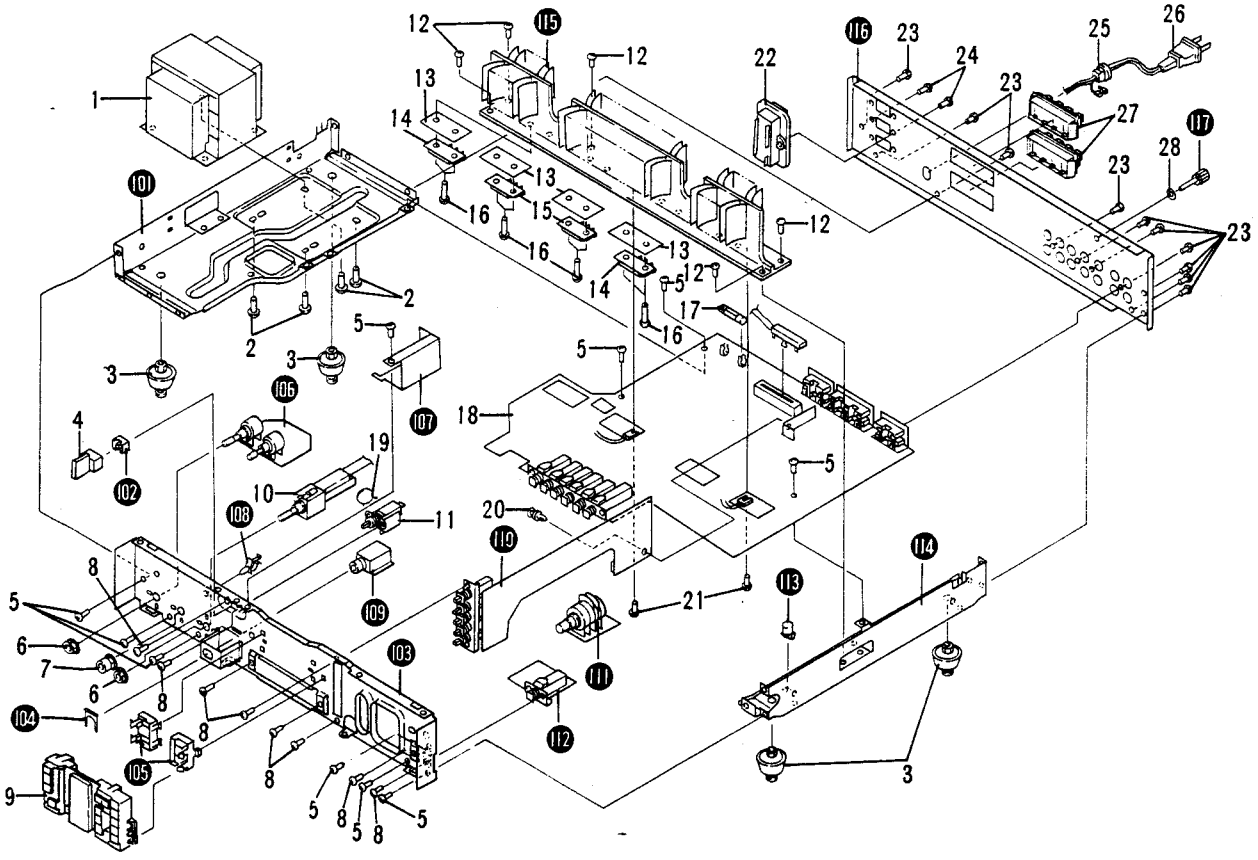
Rear Panel View



Exterior Components

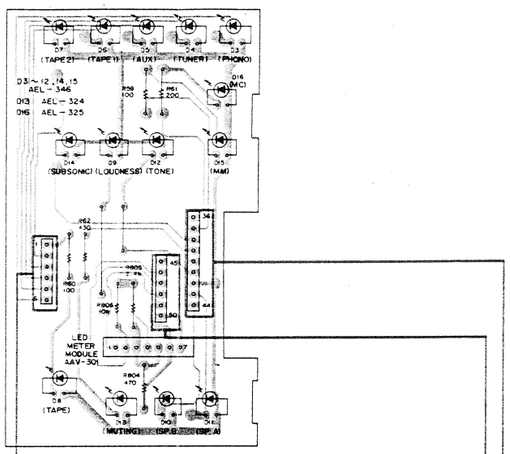


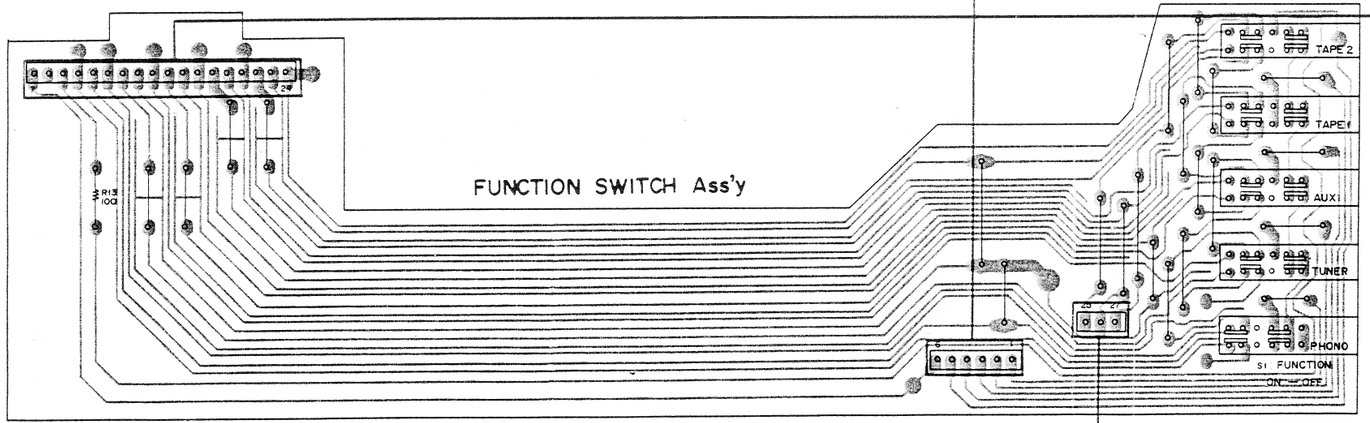
Interior Components

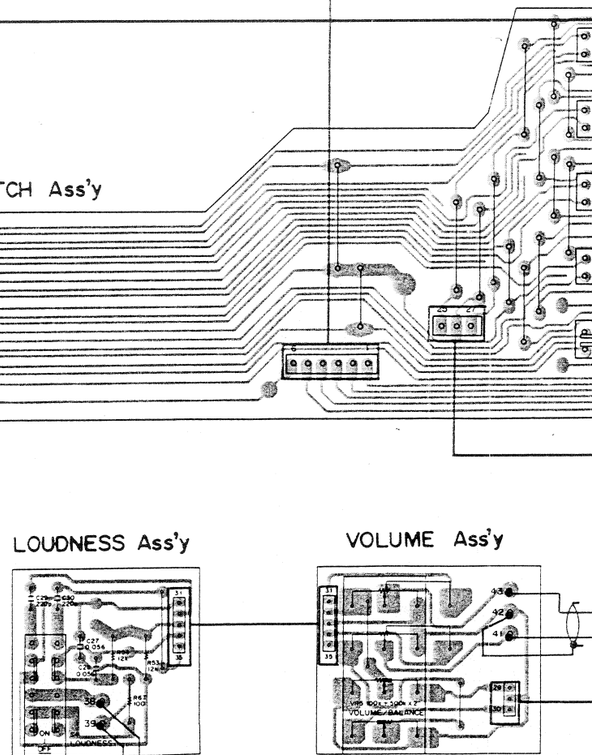


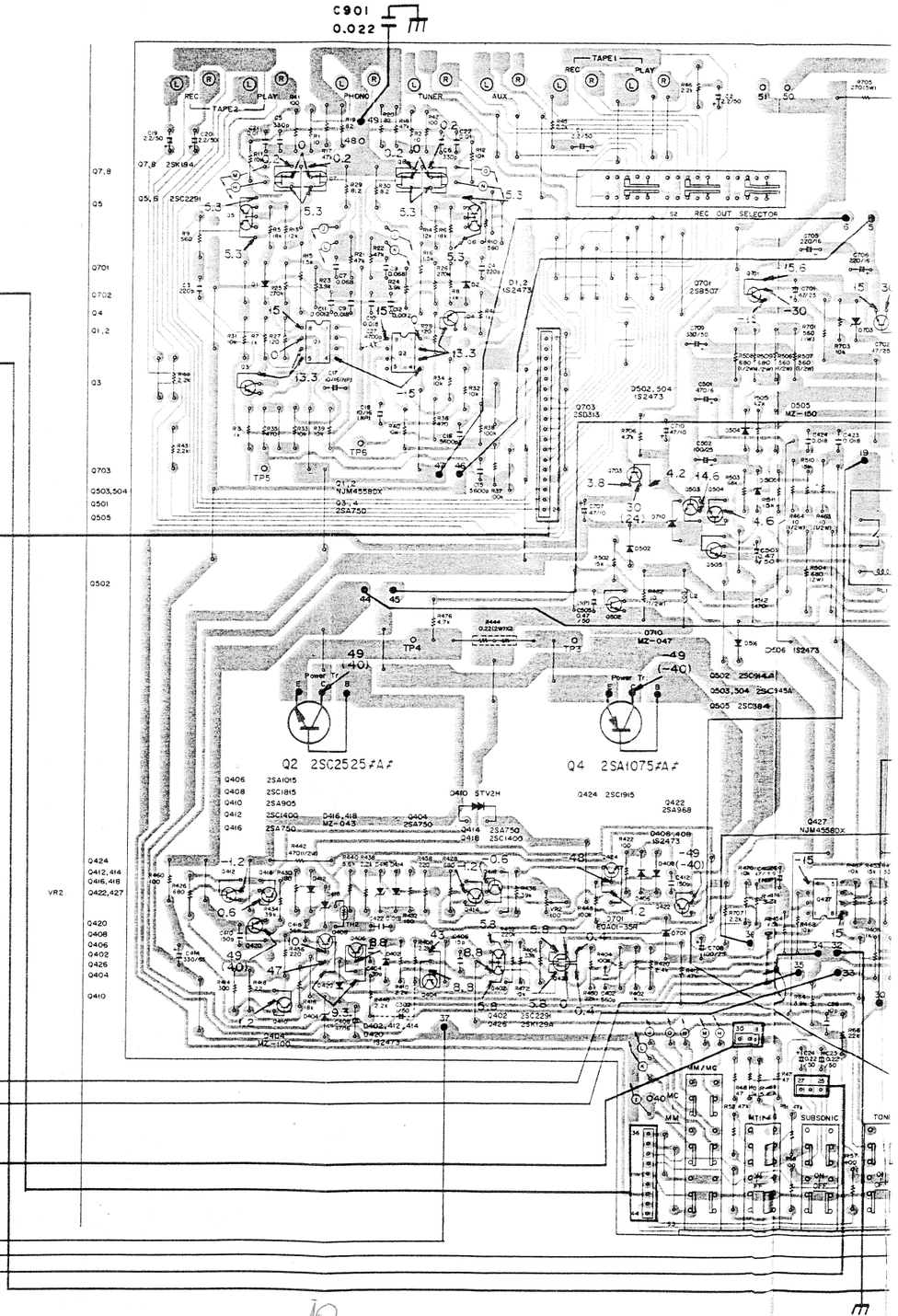
7. P.C. BOARDS CONNECTION DIAGRAM

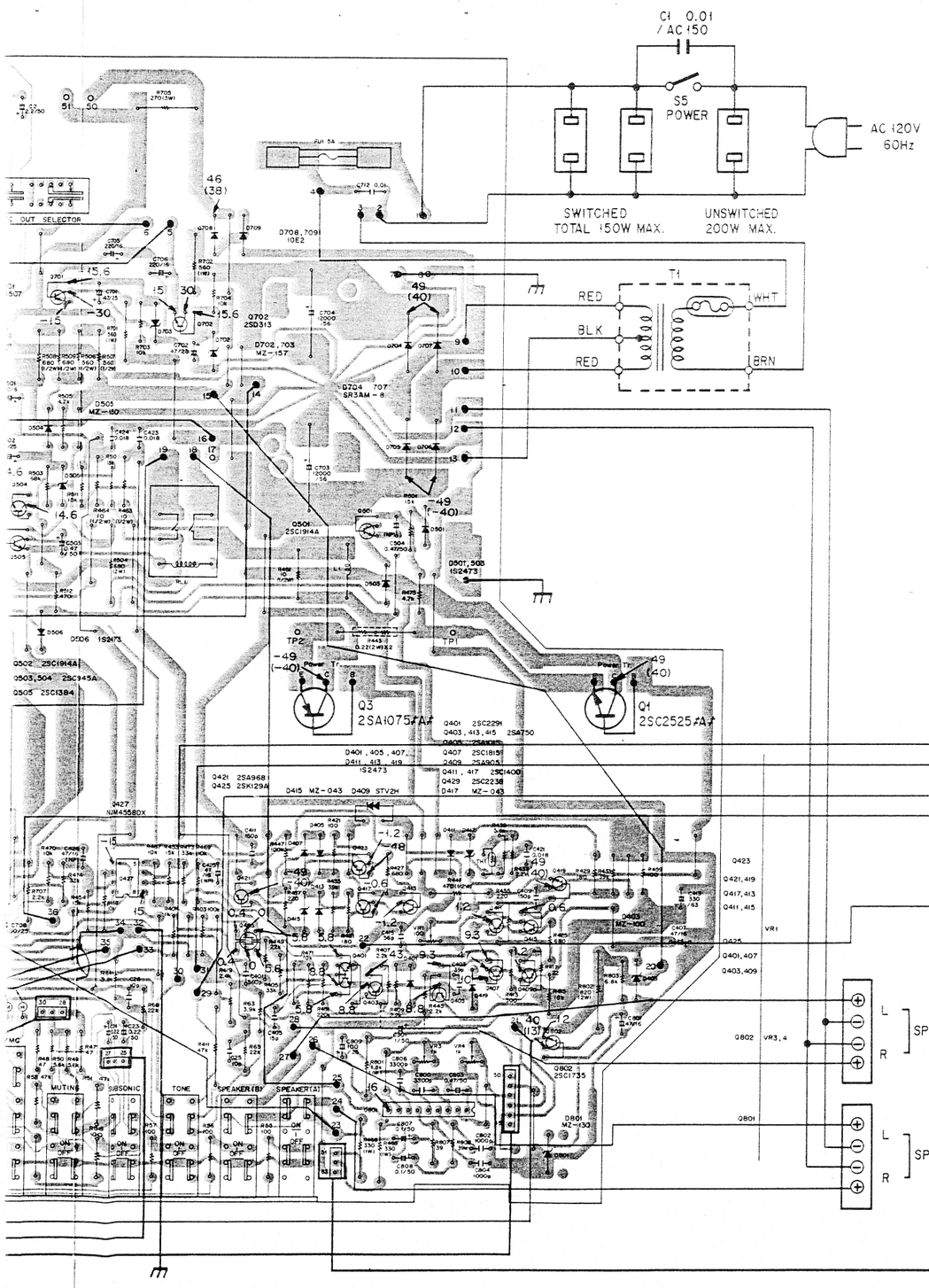
INDICATOR Ass'y





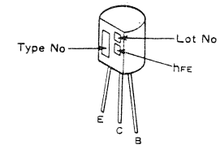






External Appearance of Transistors and ICs

2SA750
2SA1015
2SC1400
2SC1815



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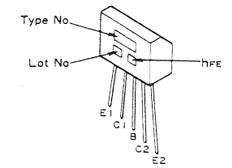
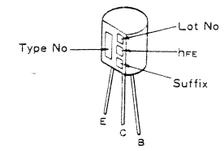


A

2SA733A
2SC945A



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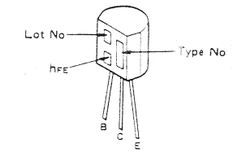
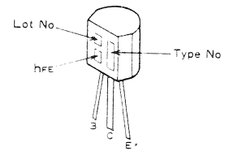
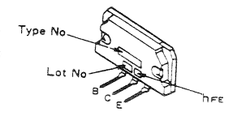


2SA905
2SC1915



2SC2525/A/
2SA1075/A/



B

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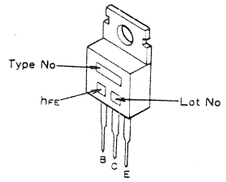
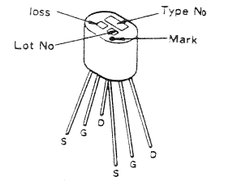
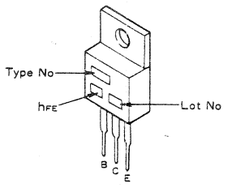
2SC2238
2SD313
2SD880
2SB834



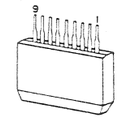
2SK129A



2SB507

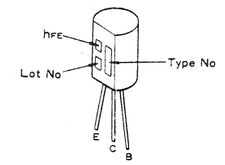


TA7318P

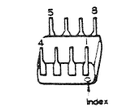


C

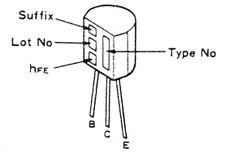
2SC1384



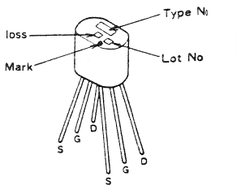
NJM4558DX
μPC4558C-P



2SC1914A



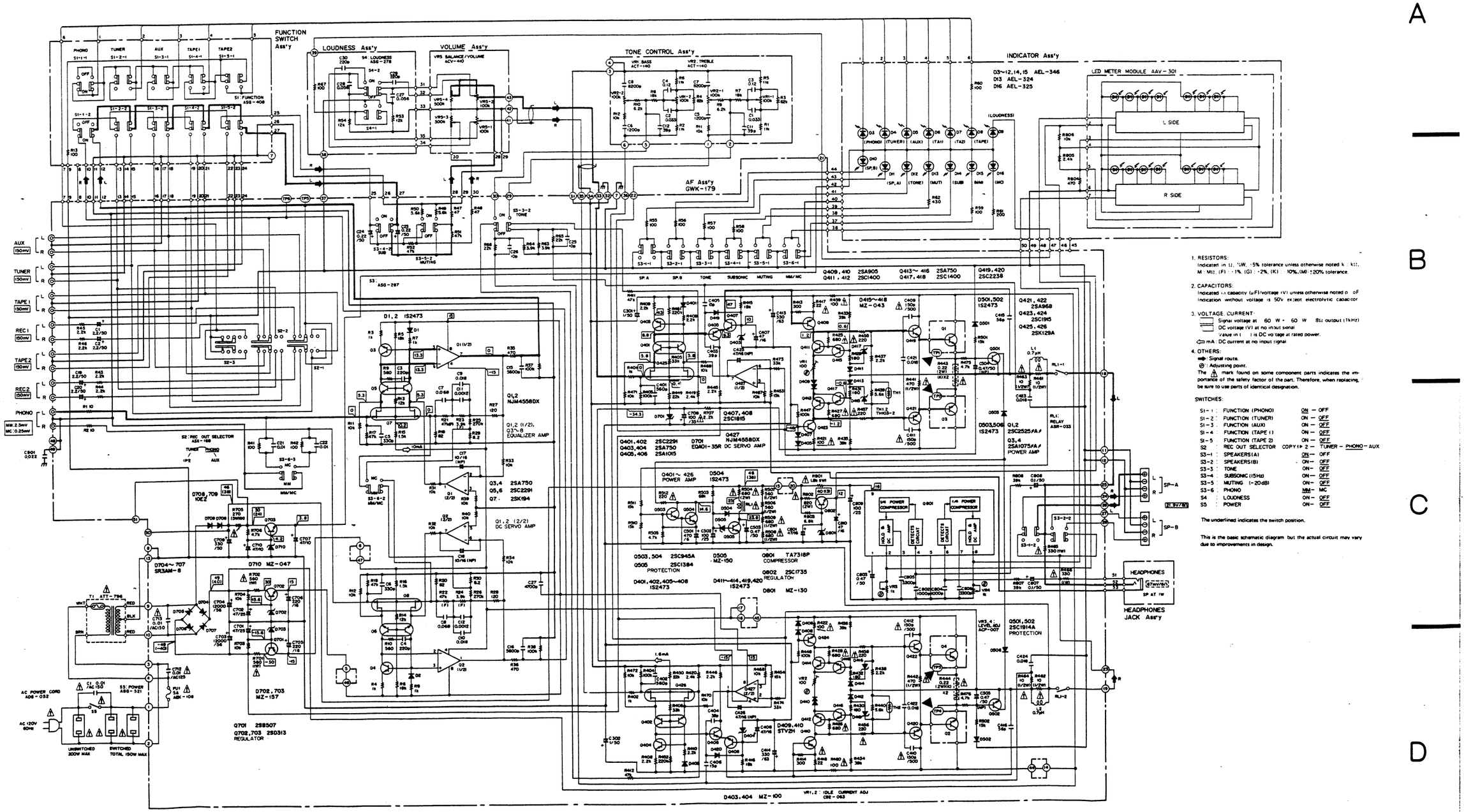
2SK194



D

8. SCHEMATIC DIAGRAM

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



1. RESISTORS:
Indicated in Ω, ¼W, ±5% tolerance unless otherwise noted k : kΩ, M : MΩ. (F) : ±1%, (G) : ±2%, (K) : ±10%, (M) : ±20% tolerance.

2. CAPACITORS:
Indicated in capacity (μF)/voltage (V) unless otherwise noted p : pF
Indication without voltage is 50V except electrolytic capacitor

3. VOLTAGE, CURRENT:
Signal voltage at 60 W + 60 W 8Ω output (1kHz)
DC voltage (V) at no input signal
Value in ( ) is DC voltage at rated power.
mA : DC current at no input signal

4. OTHERS:
Signal route.
Adjusting point.
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

SWITCHES:

S1-1	FUNCTION (PHONO)	ON — OFF
S1-2	FUNCTION (TUNER)	ON — OFF
S1-3	FUNCTION (AUX)	ON — OFF
S1-4	FUNCTION (TAPE 1)	ON — OFF
S1-5	FUNCTION (TAPE 2)	ON — OFF
S2	REC OUT SELECTOR	COPY 1 ⇔ 2 — TUNER — PHONO — AUX
S3-1	SPEAKERS (A)	ON — OFF
S3-2	SPEAKERS (B)	ON — OFF
S3-3	TONE	ON — OFF
S3-4	SUBSONIC (15Hz)	ON — OFF
S3-5	MUTING (−20dB)	ON — OFF
S3-6	PHONO	MM — MC
S4	LOUDNESS	ON — OFF
S5	POWER	ON — OFF

The underlined indicates the switch position.

This is the basic schematic diagram but the actual circuit may vary due to improvements in design.

9. ELECTRICAL PARTS LIST

NOTES:

- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*
  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω	*56 x 10¹*	*561*	*RD¼PS 5611 J*
47kΩ	*47 x 10³*	*473*	*RD¼PS 4733 J*
0.5Ω	*0R5*		*RN2H 0R55 K*
1Ω	*010*		*RS1P 0100 K*

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562 x 100*	*5621*	*RN¼SR 5622 F*

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number , temperature, humidity, etc.

Miscellaneous Parts

Mark	Part No.	Symbol & Description
⚠ ★	ATT-796	T1 Power Transformer
⚠ ★★	AEK-108	FU1 Fuse (5A/125V)
⚠ ★★	ASG-521	S1 Push switch (POWER)
⚠	ACG-019	C1 Ceramic capacitor (0.01/AC150V)
	CKDYF 223Z 50	C9
★★	2SC2525/A/-G*	Q1, Q2
★★	(2SC2525/A/-X*)	
★★	2SA1075/A/-G*	Q3, Q4
★★	(2SA1075/A/-X*)	
	*hfe of Q1—Q4 should have the same value.	
	AKE-051	Terminal (SPEAKERS)
⚠	AKP-041	AC socket (AC OUTLETS)
⚠	ADG-052	AC power cord
	GWK-179	AF assembly
	GWX-659	Indicator assembly
	AWX-212	Composition assembly (Function switch ass'y + Tone control assembly)

AF Assembly (GWK-179)

CAPACITOR

Mark	Part No.	Symbol & Description
	CEANL 2R2M 50	C1, C2, C19, C20
	ACH-212	C703, C704 Electrolytic (12000/56V)
⚠	ACG-019	C713 Ceramic (0.01/AC150V)
⚠	ACG-017	C712 Ceramic (0.01/AC125V)
	CEA 0R1M 50L	C807, C808
	CEA R47M 50L	C503, C803
	CEA R22M 50L	C23, C24
	CEA 101M 25L	C502, C809
	CEA 101M 35L	C708
	CEA 331M 63L	C413, C414
	CEA 100M 50L	C301, C302
	CEA 470M 16L	C407, C408, C801
	CEA 221M 16L	C705, C706
	CEA 470M 25L	C701, C702
	CEA 470M 10L	C707, C710
	CEA 471M 6L	C501
	CEA 331M 50L	C709
	ACH-361	C425, C426 Electrolytic (47/16V, NP)
	ACH-355	C17, C18 Electrolytic (10/16V, NP)
	CCDSL 100D 50	C25, C26
	CCDSL 150J 50	C405, C406
	CCDSL 331J 50	C5, C6
⚠	CCDSL 151K 500	C409—C412
	CCDSL 221J 50	C3, C4
	CCDSL 560J 50	C415, C416
	CCDSL 390J 50	C403, C404
	CCDSL 561J 50	C401, C402
	CKDYB 562K 50	C15, C16
	CKDYF 103Z 50 (CKDYA 103J 50)	C21, C22
	CKDYB 102K 50 (CKDYA 102J 50)	C802, C804
	CQMA 122J 50	C11, C12
	CQMA 183K 50	C421—C424
	CQMA 332K 50	C805, C806
	CQPA 183G 50	C9, C10
	CQPA 683G 50	C7, C8
	ACH-356	C504, C505 Electrolytic (0.47/50VNP)
	CKDYB 472K 50	C27

RESISTORS

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
★	C92-063	VR1, VR2 Semifixed (100k-B)
★	ACP-007	VR3, VR4 Semifixed (1k-B)
	RD¼PM □□□ J	R1—R20, R25—R52, R55—R58, R63—R66, R401—R416, R419, R420, R429—R440, R445—R454, R467—R476, R501—R503, R505, R510, R511, R703, R704, R706, R803, R807, R808
	RN¼PQ4702F	R21, R22
	RN¼PQ3901F	R23, R24
⚠	RS1P □□□ J	R465, R466, R701, R702, R801
⚠	RS2P □□□ J	R504, R802
⚠	RD½PSF □□□ J	R441, R442, R461—R464, R506—R509
⚠	RD¼PSF □□□ J	R417, R418, R422, R425—428, R455—R460, R512, R707
⚠	ACN-045	R705 Wire wound (270/5W)
⚠	ACN-070	R443, R444 Wire wound (0.22 + 0.22/2W)

SEMICONDUCTORS

Mark	Part No.	Symbol & Description
★★	NJM4558DX (μPC4558C-P)	Q1, Q2, Q427
★★	2SC1400-E* (2SC1400-U*) (2SC2603/A/-E*) (2SC2603/A/-F*)	Q411, Q412, Q417, Q418
★★	2SA750-E* (2SA750-U*) (2SA1115/A/-E*) (2SA1115/A/-F*)	Q413—Q416
	*hfe of Q411—Q418 should have the same value.	
★★	2SA750 (2SA733A)	Q3, Q4, Q403, Q404
★★	2SA1015-Y* (2SA1015-GR*)	Q405, Q406
★★	2SC1815-Y* (2SC1815-GR*)	Q407, Q408
	*hfe of Q405—Q408 should have the same value.	
★★	2SA905	Q409, Q410
★★	2SC2238-O* (2SC2238-Y*)	Q419, Q420
★★	2SA968-O* (2SA968-Y*)	Q421, Q422
	*hfe of Q419—Q422 should have the same value.	
★★	2SB507 (2SB834)	Q701
★★	2SC1384	Q505
★★	2SC1915	Q423, Q424
★★	2SC1914A	Q501, Q502
★★	2SC2291	Q5, Q6, Q401, Q402
★★	2SC945A (2SC2575)	Q503, Q504
★★	2SD313 (2SD880)	Q702, Q703,
★★	2SK194	Q7, Q8
★★	2SK129A	Q425, Q426
★★	TA7318P	Q801
★★	2SC1735 (2SD313)	Q802
★	1S2473 (1S2076) (1S1555)	D1, D2, D401, D402, D405—D408, D419, D420, D501—D504, D506
★	1S2473	D411—D414
★	MZ-047 (WZ-047)	D710
★	MZ-157 (WZ-157)	D702, D703
★	MZ-150 (WZ-150)	D505
★	MZ-043 (WZ-043)	D415—D418
★	MZ-130 (WZ-130)	D801
★	MZ-100 (WZ-100)	D403, D404
★	SR3AM-8	D704—D707
★	10E2	D708, D709
★	EQA01-35R	D701
★	STV2H	D409, D410
	TH103-2	TH1, TH2

OTHERS

Mark	Part No.	Symbol & Description
★★	ASX-169	S2 Remote slide switch (REC OUT SELECTOR)
★★	ASG-287	S3 Push switch
	AKB-078	Terminal (TAPE1, 2)
	AKB-079	Terminal (INPUT)
	ASR-033	RL1 Relay
	PBZ30P060FMC	Screw3x8

Indicator Assembly (GWX-659)

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
★	AEL-346	D3—D12, D14, D15
★	AEL-324	D13
★	AEL-325	D16
	AAV-301	LED meter module
	RD¼PM □□□ J	R59—R62, R804—R806

Volume Assembly

Mark	Part No.	Symbol & Description	
★★	ACV-410	VR5	Variable (BALANCE, VOLUME)

Headphones Jack Assembly

Mark	Part No.	Symbol & Description
	AKN-030	Headphone jack

Loudness Assembly

Mark	Part No.	Symbol & Description	
★★	ASG-278	S4	Push switch (LOUDNESS)
	CQMA 563K 50	C27, C28	
	CCDSL 221J 50	C29, C30	
	RD¼PM123J	R53, R54	
	RD¼PM101J	R67	

Function Switch Assembly

Mark	Part No.	Symbol & Description	
★★	ASG-408	S1	Push switch (FUNCTION)
	RD¼PM101J	R13	

Tone Control Assembly

CAPACITORS

Mark	Part No.	Symbol & Description
	CQMA 333K 50	C1, C2
	CQMA 122K 50	C5, C6
	CQMA 124K 50	C3, C4
	CQMA 822K 50	C7, C8
	CCDSL 390J 50	C11, C12

RESISTORS

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description	
★	ACT-140	VR1	Variable (100k-B, BASS)
★	ACT-140	VR2	Variable (100k-B, TREBLE)
	RD¼PM □□□ J	R1–R12	

10. ADJUSTMENTS

Idle Current Adjustment

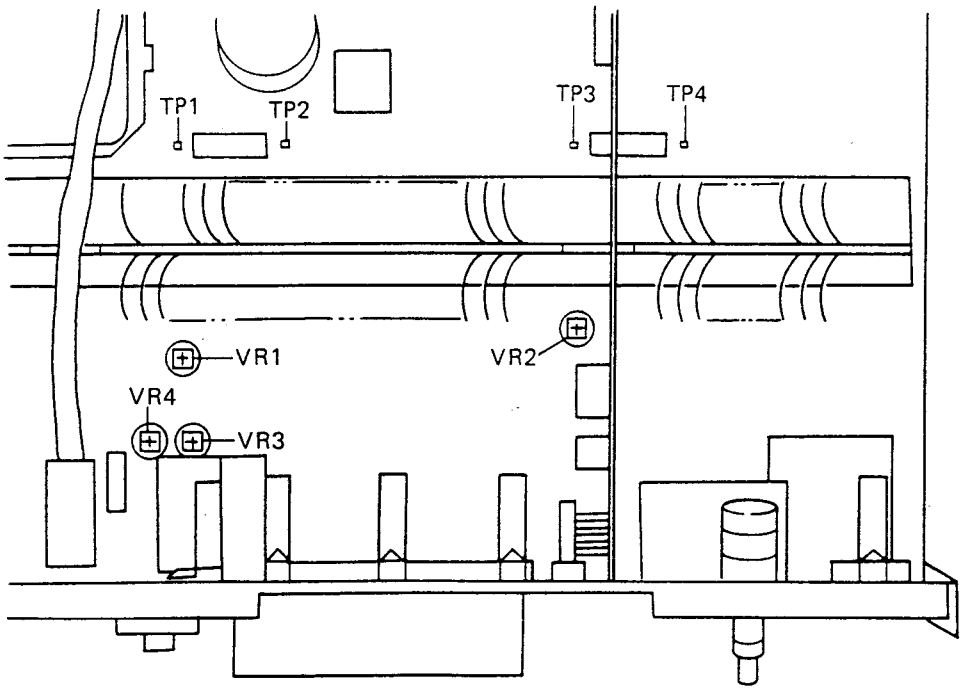
- Turn VR1 (L) and VR2 (R) fully around in the counter-clockwise direction.
- Without any load or input signal, turn to POWER switch ON and let stand for 10 minutes.

Adjustment point	Prescribed value	Measuring terminal
VR1 (L)	31mV ±13mV	TP1(+) and TP2(−)
VR2 (R)	31mV ±13mV	TP4(+) and TP3(−)

Output Power Indicator Calibration

1. Set the SPEAKERS selector to the A position, and connect an 8Ω resistor and AC voltmeter to the speaker output terminals.
2. Set the FUNCTION switch to the AUX position, and apply a 1kHz, 150mV signal to the AUX input terminals.
3. Adjust the VOLUME control for an AC voltmeter reading of 20V.
4. Adjust VR3 (L) and VR4 (R) so that the all green points of the output power indicators lights and the red point goes out.

- Remove the top cover



10. RÉGLAGE

Réglage du courant déwatté

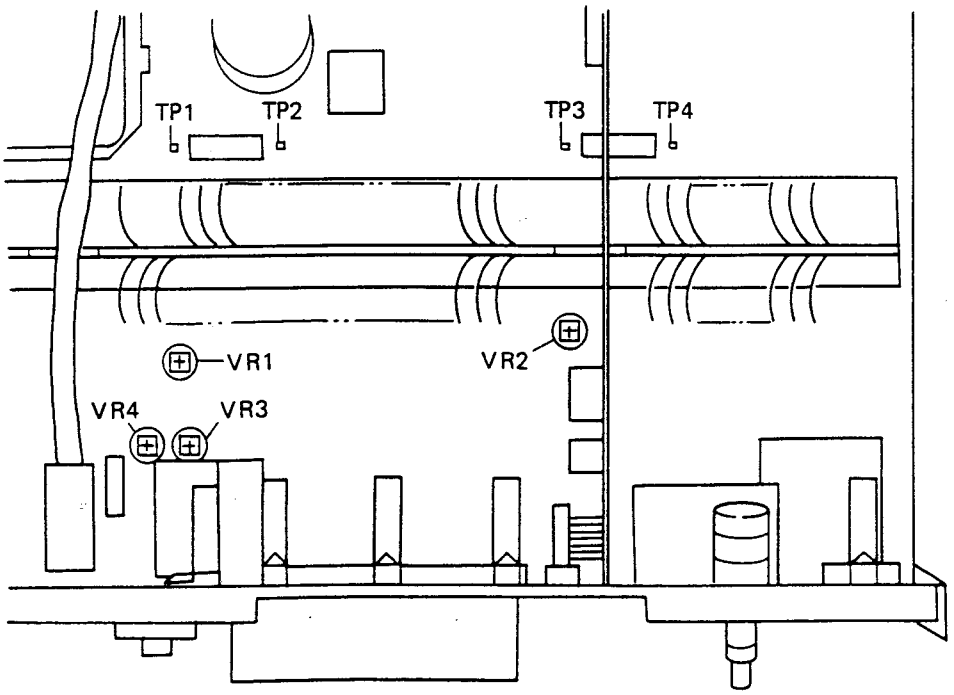
- Tourner à fond VR1 (L, gauche) et VR2 (R, droite) en sens inverse des aiguilles d'une montre.
- Sans charge ni signal d'entrée, allumer l'interrupteur POWER et le maintenir 10 minutes.

Point de réglage	Valeur prescrite	Terminal de mesure
VR1 (L)	31 mV ± 13 mV	TP1 (+) et TP2 (–)
VR2 (R)	31 mV ± 13 mV	TP4 (+) et TP3 (–)

Etalonnage de l'indicateur de puissance de sortie

1. Placer le sélecteur SPEAKERS en position A et brancher une résistance 8 Ω et un wattmètre CA aux bornes de sortie.
2. Placer l'interrupteur FUNCTION en position AUX et transmettre un signal 1 kHz, 150 mV aux bornes d'entrée AUX.
3. Régler la commande VOLUME pourune lecture wattmètre CA de 20 V.
4. Régler VR3 (L, gauche) et VR4 (R, droite) pour allumer tous les points verts des indicateurs de puissance de sortie et éteindre le point rouge.

Enlever le couvercle



10. AJUSTE

Ajuste de la corriente la corriente devatiada

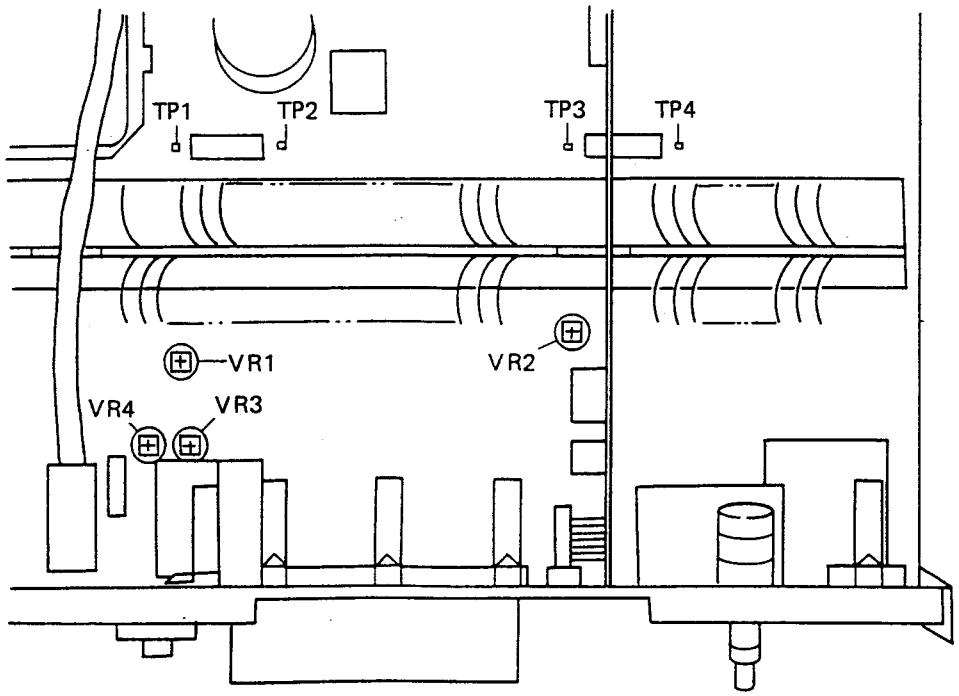
- Girar la VR1 (L, izquierda) VR2 (R, derecha) totalmente en la dirección hacia la izquierda.
- Sin ninguna carga o señal de entrada, girar el interruptor de la alimentación (POWER) a ON y manténgalo por 10 minutos.

Punto de ajuste	Valor determinado	Terminal de medida
VR1 (L)	31 mV ± 13 mV	TP1 (+) y TP2 (–)
VR2 (R)	31 mV ± 13 mV	TP4 (+) y TP3 (–)

Calibración del indicador de la alimentación de salida

1. Ajustar el selector de los altavoces (SPEAKERS) a la posición A, y conectar un resistor de 8 ohmio y un voltímetro de CA a los terminales de salida del altavoz.
2. Ajustar el selector de función (FUNCTION) a la posición AUX, y aplicar una señal de 1 kHz, 150 mV a los terminales de entrada AUX.
3. Ajustar el control de volumen (VOLUME) para una lectura del voltímetro de CA de 20 V
4. Ajustar VR3 (L, izquierda) y VR4 (R, derecha) de modo que todos los puntos verdes de los indicadores de la alimentación de salida se iluminen y el punto rojo se desconecte.

Extraer la tapa



ADDITIONAL

Service Manual

PIONEER®

ORDER NO.
ART-618-0

NON SWITCHING AMP
STEREO AMPLIFIER

A-6 HE, HB

- **The basic performance of the HE and HB types is the same as the KU type, please refer to the KU type service manual (ART-617) with the exception of this supplements.**

SPECIFICATIONS

The specifications for HE and HB types are the same as the KU type except for following sections:

Amplifier Section

Continuous Power Output at 1kHz (both channels driven)
T.H.D. 0.005%, 8 ohms . . . . . .70 watts per channel
Hum and Noise (DIN, continuous Power/50mW)
PHONO MM. 80dB/66dB
MC 70dB/65dB
TUNER, AUX, TAPE PLAY 95dB/69dB

Miscellaneous

Power Requirements . . . . . .220V/240V (Switchable) 50/60Hz
Power Consumption 350W

Line Voltage Selection

Line voltage can be changed with following steps.

1. Disconnect the AC power cord.
2. Remove the top cover.
3. Take out the fuse (AEK-017) from the fuse assembly.
4. Re-install the fuse in the correct voltage indication (see Fig. 1).
5. Stick the line voltage label on the rear panel.

Part No.	Description
AAX-193	220V label
AAX-192	240V label

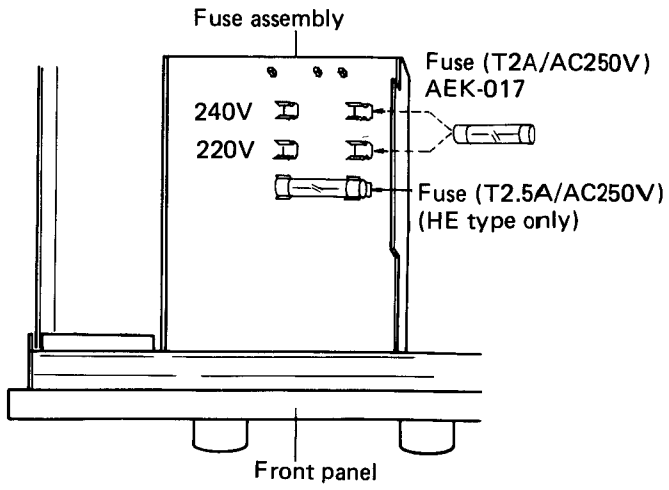


Fig. 1

PIONEER ELECTRONIC CORPORATION 4-1, Meguro 1-Chome, Meguro-ku, Tokyo 153, Japan
U.S. PIONEER ELECTRONICS CORPORATION 85 Oxford Drive, Moonachie, New Jersey 07074, U.S.A.
PIONEER ELECTRONIC (EUROPE) N.V. Luithagen-Haven 9, 2030 Antwerp, Belgium
PIONEER ELECTRONICS AUSTRALIA PTY. LTD. 178-184 Boundary Road, Braeside, Victoria 3195, Australia

Y L ©APR. 1981 Printed in Japan

CONTRAST OF MISCELLANEOUS PARTS

NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ *GENERALLY MOVES FASTER THAN* ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

P.C. BOARD ASSEMBLY

Mark	Symbol & Description	Part No.			Remarks
		KU type	HE type	HB type	
	AF assembly	GWK-179	GWK-181	GWK-181	

ELECTRICAL PARTS

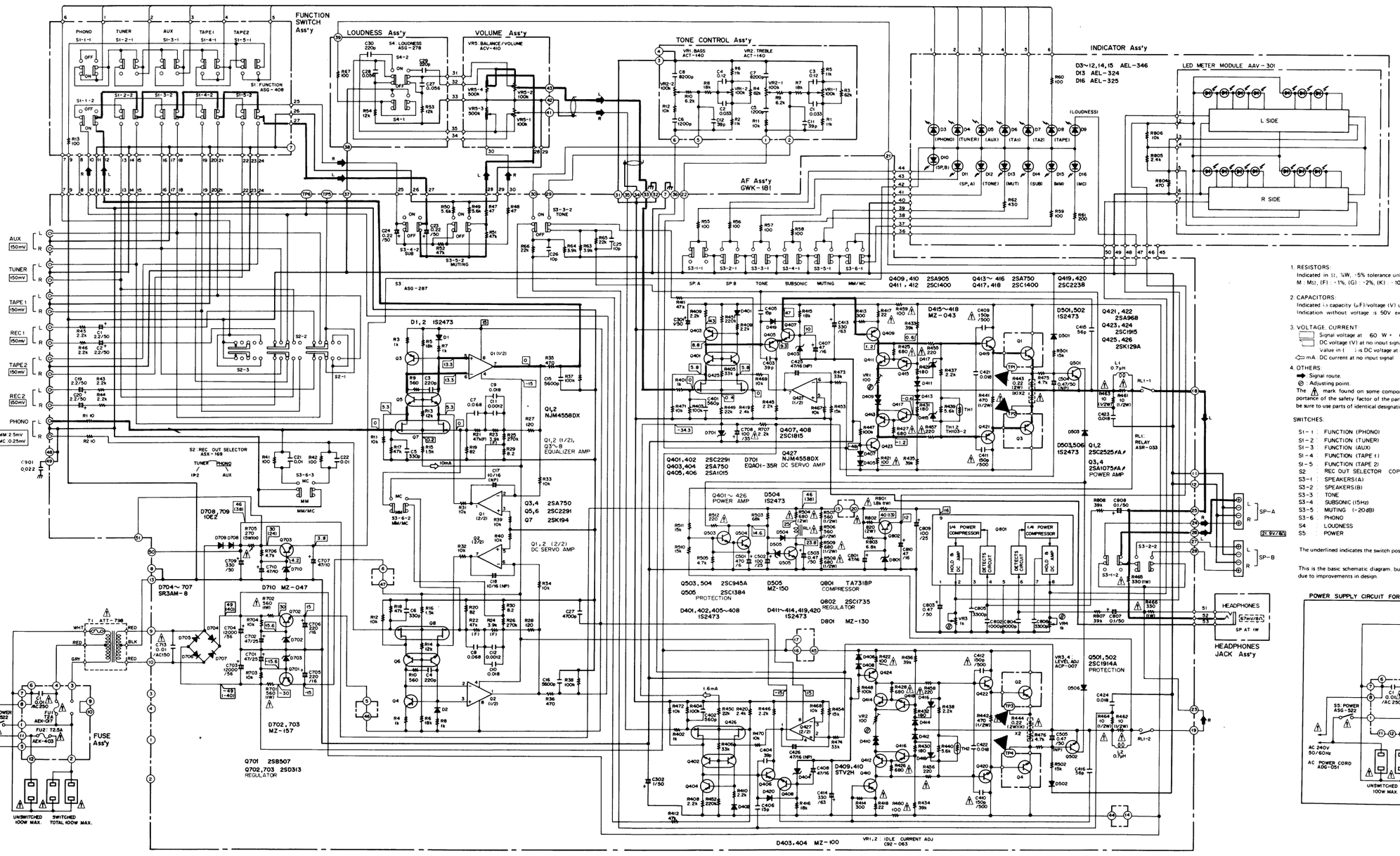
Mark	Symbol & Description		Part No.			Remarks
			KU type	HE type	HB type	
⚠ ★	T1	Power transformer (120V)	ATT-796	.....	.....	
⚠ ★	T1	Power transformer (220V, 240V)	.....	ATT-798	ATT-798	
⚠ ★★	FU1	Fuse (5A)	AEK-108	.....	.....	
⚠ ★★	FU1	Fuse (T2A/AC250V)	.....	AEK-017	AEK-017	
⚠ ★★	FU2	Fuse (T2.5A/AC250V)	.....	AEK-403	.....	
⚠ ★★	S1	Push switch (POWER)	ASG-521	ASG-522	ASG-522	
⚠	C1	Ceramic capacitor (0.01/AC150V)	ACG-019	.....	.....	
⚠		AC socket (AC OUTLETS)	AKP-041	AKP-026	AKP-044	
⚠		AC power cord	ADG-052	ADG-041	ADG-051	

FURNISHED PARTS

Mark	Symbol & Description	Part No.			Remarks
		KU type	HE type	HB type	
	Operating instructions (English)	ARB-415	.....	ARB-422	
	Operating instructions (English, French, German, Italian)	.....	ARD-168	.....	

SCHEMATIC DIAGRAM

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



1. RESISTORS:
Indicated in Ω, 1/4W, ±5% tolerance unless otherwise noted k : kΩ, M : MΩ, (F) : ±1%, (G) : ±2%, (K) : ±10%, (M) : ±20% tolerance.

2. CAPACITORS:
Indicated in capacity (μF)/voltage (V) unless otherwise noted p : pF. Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE, CURRENT:
Signal voltage at 60 W + 60 W 8Ω output (1kHz)
DC voltage (V) at no input signal
Value in ( ) is DC voltage at rated power
⇦ mA: DC current at no input signal

4. OTHERS:
➡ : Signal route.
⊘ : Adjusting point.
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

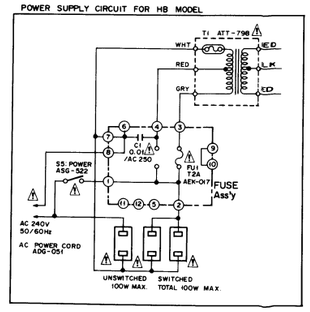
SWITCHES:

S1-1	FUNCTION (PHONO)	ON — OFF
S1-2	FUNCTION (TUNER)	ON — OFF
S1-3	FUNCTION (AUX)	ON — OFF
S1-4	FUNCTION (TAPE 1)	ON — OFF
S1-5	FUNCTION (TAPE 2)	ON — OFF
S2	REC OUT SELECTOR	COPY 1 ▶ 2 — TUNER — PHONO · AUX
S3-1	SPEAKERS(A)	ON — OFF
S3-2	SPEAKERS(B)	ON — OFF
S3-3	TONE	ON — OFF
S3-4	SUBSONIC (15Hz)	ON — OFF
S3-5	MUTING (-20dB)	ON — OFF
S3-6	PHONO	MM — MC
S4	LOUDNESS	ON — OFF
S5	POWER	ON — OFF

The underlined indicates the switch position.

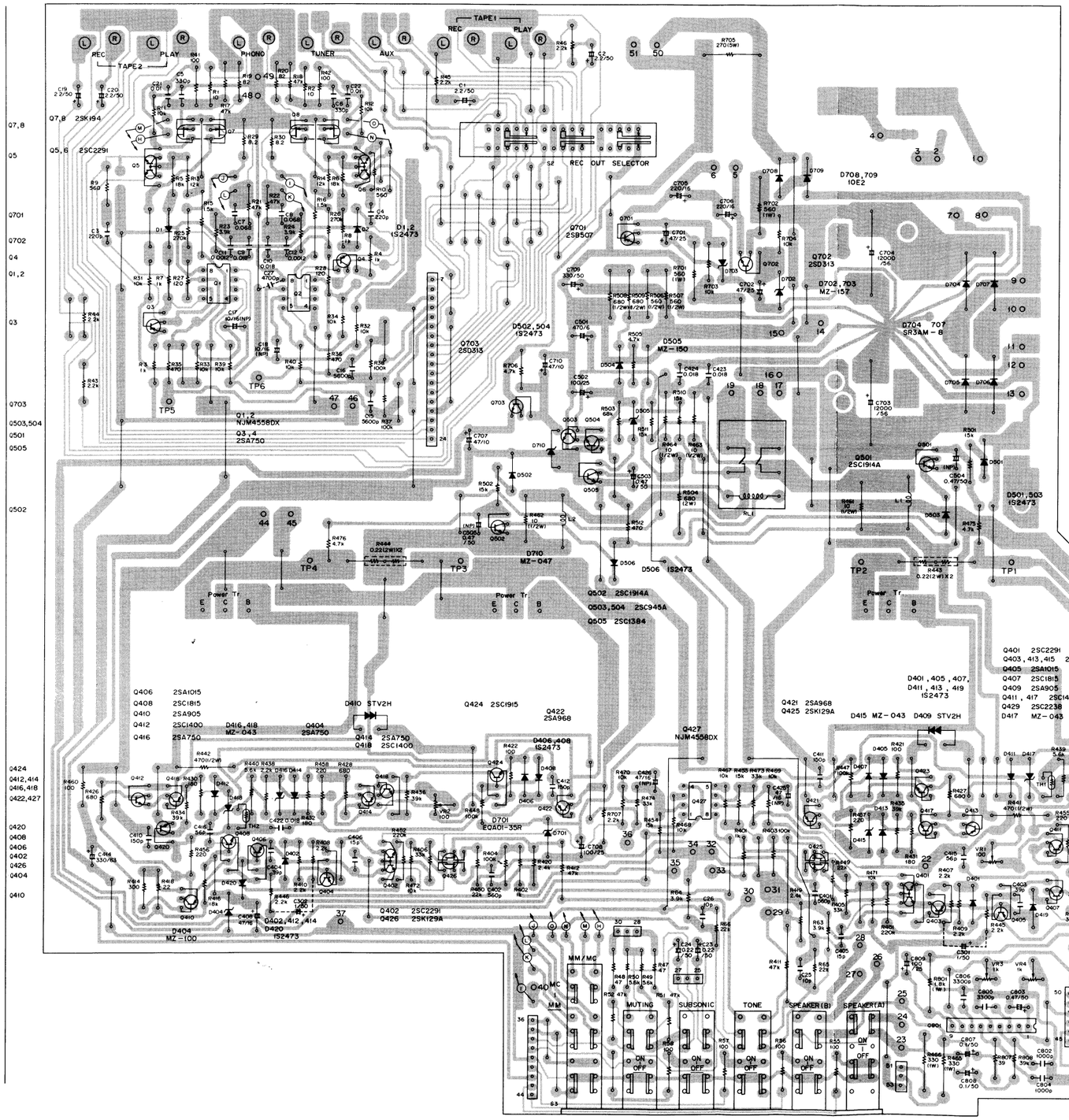
This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

POWER SUPPLY CIRCUIT FOR HB MODEL

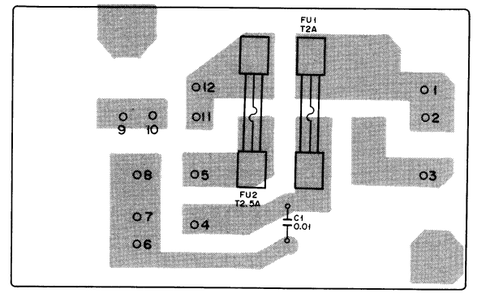


P.C. BOARD ASSEMBLIES

AF Assembly (GWK-181)



Fuse Assembly



Parts List of AF Assembly (GWK-181)

CAPACITORS

Mark	Part No.	Symbol & Description
	CEANL 2R2M 50	C1, C2, C19, C20
	ACH-212	C703, C704 Electrolytic (12000/56V)
⚠	ACG-019	C713 Ceramic (0.01/AC150V)
	CEA 0R1M 50L	C807, C808
	CEA R47M 50L	C503–C505, C803
	CEA R22M 50L	C23, C24
	CEA 101M 25L	C502, C809
	CEA 101M 35L	C708
	CEA 331M 63L	C413, C414
	CEA 470M 16L	C407, C408, C801
	CEA 100M 50L	C301, C302
	CEA 221M 16L	C705, C706
	CEA 470M 25L	C701, C702
	CEA 470M 10L	C707, C710
	CEA 471M 6L	C501
	CEA 331M 50L	C709
	CEA 470M 16L	C810
	ACH-361	C425, C426 Electrolytic (47/16V, NP)
	ACH-355	C17, C18 Electrolytic (10/16V, NP)
	CCDSL 100D 50	C25, C26
	CCDSL 150J 50	C405, C406
	CKDYB 472K 50	C27
	CCDSL 331J 50	C5, C6
⚠	CCDSL 151K 500	C409–C412
	CCDSL 221J 50	C3, C4, C417–C420
	CCDSL 560J 50	C415, C416
	CCDSL 820J 50	C403, C404
	CCDSL 561J 50	C401, C402
	CKDYB 562K 50	C15, C16
	CKDYF 103Z 50 (CKDYA 103J 50)	C21, C22
	CKDYB 102K 50 (CKDYA 102J 50)	C802, C804
	CQMA 122J 50	C11, C12
	CQMA 183K 50	C421–C424
	CQMA 332K 50	C805, C806
	CQPA 183G 50	C9, C10
	CQPA 683G 50	C7, C8

RESISTORS

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
★	C92-063	VR1, VR2 Semifixed (100k-B)
★	ACP-007	VR3, VR4 Semifixed (1k-B)
	RD¼PM□□□J	R1–R20, R25–R52, R55–R58, R63–R66, R401–R416, R419, R420, R429–R440, R445–R454, R467–R476, R501–R503, R505, R510, R511, R703, R704, R706, R803, R807, R808
	RN¼PQ4702F	R21, R22
	RN¼PQ3901F	R23, R24
	RD¼PMF□□□J	R456–R458, R707
⚠	RS1P□□□J	R465, R466, R701, R702, R801
⚠	RS2P821J	R504, R802
⚠	RD½PSF□□□J	R441, R442, R461–R464, R506–R509
⚠	RD¼PSFL□□□J	R417, R418, R421, R422, R425–R428, R455, R459, R460, R512
	ACN-070	R443, R444 Wire wound (270/5W)
	ACN-045	R705 Wire wound (0.22 + 0.22/2W)

SEMICONDUCTORS

Mark	Part No.	Symbol & Description
★★	NJM4558DX (μPC4558C-P)	Q1, Q2, Q427
★★	2SC1400-E* (2SC1400-U*) (2SC2603/A/-E*) (2SC2603/A/-F*)	Q411, Q412, Q417, Q418
★★	2SA750-E* (2SA750-U*) (2SA1115/A/-E*) (2SA1115/A/-F*)	Q413–Q416
	*hfe of Q411–Q418 should have the same value.	
★★	2SA750 (2SA733A)	Q3, Q4, Q403, Q404
★★	2SA1015-Y* (2SA1015-GR*)	Q405, Q406
★★	2SC1815-Y* (2SC1815-GR*)	Q407, Q408
	*hfe of Q405–Q408 should have the same value.	
★★	2SA905	Q409, Q410
★★	2SC2238-O* (2SC2238-Y*)	Q419, Q410
★★	2SA968-O* (2SA968-Y*)	Q421, Q422
	*hfe of Q419–Q422 should have the same value.	
★★	2SB507 (2SB684)	Q701
★★	2SC1384	Q505
★★	2SC1915	Q423, Q424
★★	2SC1914A	Q501, Q502
★★	2SC2291	Q5, Q6, Q401, Q402
★★	2SC945A (2SC2575)	Q503, Q504
★★	2SD313 (2SD880)	Q702, Q703, Q802
★★	2SK194	Q7, Q8
★★	2SK129A	Q425, Q426
★★	TA7318P	Q801
★	1S2473 (1S2076) (1S1555)	D1, D2, D401, D402, D405–D408, D419, D420, D501–D504, D506
★	1S2473	D411–D414
★	MZ-047 (WZ-047)	D710

Mark	Part No.	Symbol & Description
★	MZ-157 (WZ-157)	D702, D703
★	MZ-150 (WZ-150)	D505
★	MZ-043 (WZ-043)	D415–D418
★	MZ-130 (WZ-130)	D801
★	MZ-100 (WZ-100)	D403, D404
★	SR3AM-8	D704–D707
★	10E2	D708, D709
★	EQA01-35R	D701
★	STV2H	D409, D410
	TH103-2	TH1, TH2

OTHERS

Mark	Part No.	Symbol & Description	
★★	ASX-169	S2	Remote slide switch (REC OUT SELECTOR)
★★	ASG-287	S3	Push switch (SPEAKERS A, B, TONE, SUBSONIC, MUTING, PHONO MM/MC)
	AKB-078	Terminal	(TAPE 1, 2)
	AKB-079	Terminal	(INPUT)
	ASR-033	RL1	Relay
	VBZ30P080FMC	Screw 3x8	

Parts List of Fuse Assembly

Mark	Part No.	Symbol & Description	
⚠	ACG-001	C1	Ceramic capacitor (0.01/AC250V)